Chapter : 19. VOLUME AND SURFACE AREA OF SOLIDS

Exercise : 19A

Question: 1

Two cubes each of

Solution:

Let the length of the side of cube be ‘a’ cm.

Volume of each cube = 27 cm^3

Volume of cube = a^3

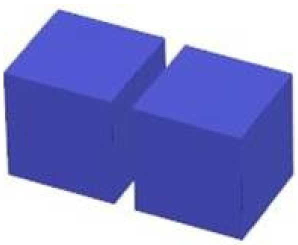
$\therefore a^3 = 27\ cm^3$

$\Rightarrow a = (27\ cm^3)^{1/3}$

$\Rightarrow a = 3$ cm

Length of a side of cube = 3 cm

Since, two cubes are joined and a cuboid is formed so,



Length of cuboid = l = 2a = 2 × 3 cm = 6 cm

Breadth of cuboid = b = a = 3 cm

Height of cuboid = h = a = 3 cm

Surface area of cuboid = 2 × (l × b + b × h + l × h)

$\therefore$ Surface area of resulting cuboid = 2 × (6 × 3 + 3 × 3 + 6 × 3) cm^2

= 2 × (18 + 9 + 18) cm^2

= 2 × 45 cm^2

= 90 cm^2

So, surface area of resulting cuboid is 90 cm^2

Question: 2

The Volume of a h

Solution:

Let the radius of hemisphere be r cm

Volume of hemisphere is given by $\frac{2}{3}\pi r^3$

Given, volume of hemisphere = 24251/2 cm^3

$\therefore \frac{2}{3}\pi r^3 = 24251/2$

$\Rightarrow r^3 = 4851 \times 1/2 \times 3/2 \times 7/22$

$\Rightarrow r^3 = 1157.625\ cm^3$

$\Rightarrow r = (1157.625)^{1/3}$ cm

$\Rightarrow r = 10.5$ cm

Curved Surface Area of hemisphere = $2\pi r^2$

Curved Surface Area of hemisphere = $2 \times 22/7 \times (10.5)^2$ cm^2

= 693 cm^2

∴ Curved surface area of hemisphere = 693 cm^2

Question: 3

If the total surf

Solution:

Let the radius of solid sphere be r cm

Total surface area of solid hemisphere = $3\pi r^2$

Given, total surface area of solid hemisphere = 462 cm^2

∴ $3\pi r^2 = 462$ cm^2

$\Rightarrow 3 \times 22/7 \times r^2 = 462$ cm^2

$\Rightarrow r^2 = 462 \times 1/3 \times 7/22$ cm^2 = 49 cm^2

$\Rightarrow r = 7$ cm

Volume of solid hemisphere = $\frac{4}{3}\pi r^3$

= $2/3 \times 22/7 \times 7^3$ cm^3

= 718.67 cm^3

∴ Volume of solid hemisphere is 718.67 cm^3

Question: 4

A 5-m-wide cloth

Solution:

Width of cloth used = 5 m

Diameter of conical tent to be made = 14 m

Let the radius of the conical tent be r m

Radius of conical tent = r = diameter ÷ 2 = 14/2 m = 7 m

Height of conical tent = h = 24 m

Let the slant height of conical tent be l

So, $l = \sqrt{r^2 + h^2}$

$\Rightarrow l = \sqrt{7^2 + 24^2}$ m^2

$\Rightarrow l = 25$ m

Area of cloth required to make a conical tent = Curved Surface area of conical tent

= πrl

= $22/7 \times 7 \times 25$ m^2

= 550 m^2

Length of cloth used = Area of cloth required ÷ width of cloth

= 550/5 m

= 110 m

∴ Length of cloth used = 110 m

Cost of cloth used = Rs 25 per meter

Total Cost of cloth required to make a conical tent = 110 × Rs 25

= Rs 2750

∴ Total cost of cloth required to make a conical tent = Rs 2750

Question: 5

If the volumes of

Solution:

Let V_1 be the volume of first cone and V_2 be the volume of second cone.

Then, $V_1:V_2 = 1:4$

Let d_1 be the diameter of first cone and d_2 be the diameter of second cone.

Then $d_1:d_2 = 4:5$

Let h_1 be the height of first cone and h_2 be the height of second cone.

We know that volume of cone is given by $V = 1/3 \times \pi(d^2/4)h$

$$\frac{V_1}{V_2} = \frac{1}{4}$$

$$\therefore \frac{V_1}{V_2} = \frac{\frac{1}{3}\pi\frac{d_1^2}{4}h_1}{\frac{1}{3}\pi\frac{d_2^2}{4}h_2}$$

$$\frac{V_1}{V_2} = \frac{d_1^2h_1}{d_2^2h_2}$$

$$\frac{d_1^2h_1}{d_2^2h_2} = \frac{1}{4}$$

$$\Rightarrow \left(\frac{d_1}{d_2}\right)^2 \times \frac{h_1}{h_2} = \frac{1}{4}$$

$$\Rightarrow \left(\frac{4}{5}\right)^2 \times \frac{h_1}{h_2} = \frac{1}{4}$$

$$\Rightarrow \frac{16}{25} \times \frac{h_1}{h_2} = \frac{1}{4} \Rightarrow \frac{h_1}{h_2} = \frac{1}{4} \times \frac{25}{16}$$

$$\Rightarrow \frac{h_1}{h_2} = \frac{25}{64}$$

∴ $h_1:h_2 = 25:64$

∴ Ratio of height of two cones is 25:64.

Question: 6

The slant height

Solution:

Let the radius of base be ‘r’ km and slant height be ‘l’ km

Slant height of conical mountain = 2.5 km

Area of its base = 1.54 km^2

Area of base is given by πr^2

$\therefore \pi r^2 = 1.54\ km^2$

$\Rightarrow 22/7 \times r^2 = 1.54\ km^2$

$\Rightarrow r^2 = 1.54 \times 7/22\ km^2 = .49\ km^2$

$\Rightarrow r = 0.7$ km

Let 'h' be the height of the mountain

We know,

$l^2 = r^2 + h^2$

Substituting the values of l and r in the above equation

$2.5^2 = 0.7^2 + h^2$

$h^2 = 2.5^2 – 0.7^2 = 6.25 – 0.49\ km^2$

$h^2 = 5.76\ km^2$

h = 2.4 km

∴ Height of the mountain = 2.4 km

Question: 7

The Sum of the ra

Solution:

Let the Radius of the solid cylinder be 'r' m and its height be 'h' m.

Given,

Sum of radius and height of solid cylinder = 37 m

r + h = 37 m

r = 37 – h

Total surface area of solid cylinder = 1628 m^2

Total surface area of solid cylinder is given by $2\pi r (h + r)$

$\therefore 2\pi r (h + r) =1628\ m^2$

Substituting the value of r + h in the above equation

$\Rightarrow 2\pi r \times 37 = 1628\ m^2$

$\Rightarrow r = 1628 \times 7/22 \times 1/2 \times 1/37$ m

$\Rightarrow r = 7$ m

Since, r + h = 37 m

h = 37 – r m

h = 37 – 7 m = 30 m

Volume of solid cylinder = $\pi r^2 h$

$= 22/7 \times 7^2 \times 30\ m^2$

$= 4620\ m^2$

Question: 8

The surface area

Solution:

Let the radius of sphere be ‘r’ cm

Surface area of sphere = 2464 cm^2

Surface area of sphere is given by $4\pi r^2$

$\therefore 4\pi r^2 = 2464\ cm^2$

$\Rightarrow 4 \times 22/7 \times r^2 = 2464\ cm^2$

$\Rightarrow r^2 = 2464 \times 1/4 \times 7/22\ cm^2 = 196\ cm^2$

$\Rightarrow r = 14$ cm

Radius of new sphere is double the radius of given sphere.

Let the radius of new sphere be r’ cm

$\therefore r' = 2r$

r’ = 2 × 14 cm = 28 cm

Surface area of new sphere = $4\pi r'^2$

$= 4 \times 22/7 \times 28^2\ cm^2$

$= 9856\ cm^2$

$\therefore$ Surface area of new sphere is 9856 cm^2.

Question: 9

A military tent o

Solution:

The military tent is made as a combination of right circular cylinder and right circular cone on top.

Total Height of tent = h = 8.25 m

Base diameter of tent = 30 m

Base radius of tent = r = 30/2 m = 15 m

Height of right circular cylinder = 5.5 m

Curved surface area of right circular cylindrical part of tent = $2\pi rh$

Height of conical part = total height of tent – height of cylindrical part

$h_{cone} = 8.25 – 5.5$ m = 2.75 m

Base radius of cone = 15 m

Let l be the slant height of cone

Then, $l^2 = h_{cone}^2 + r^2 = 2.75^2 + 15^2\ m^2$

$l^2 = 7.5625 + 225\ m^2 = 232.5625$

l = 15.25

Curved surface area of conical part of the tent = πrl

Total surface area of the tent = Curved surface area of cylindrical part + curved surface area of conical part

Total surface area of tent = $2\pi rh + \pi rl$

$= \pi r (2h + l)$

$= 22/7 \times 15 \times (2 \times 5.5 + 15.25)\ m^2$

$= 22/7 \times 15 \times (11 + 15.25)\ m^2$

$= 22/7 \times 15 \times 26.25\ m^2$

$= 1237.5\ m^2$

Breadth of canvas used = 1.5 m

Length of canvas used = Total surface area of tent ÷ breadth of canvas used

Length of canvas used = 1237.5\1.5 m = 825 m

∴ Length of canvas used is 825 m.

Question: 10

A tent is in the

Solution:

The tent is made as a combination of right circular cylinder and right circular cone on top.

Height of cylindrical part of the tent = h = 3 m

Radius of its base = r = 14 m

Curved surface area of cylindrical part of tent = 2πrh

$= 2 \times 22/7 \times 14 \times 3\ m^2$

$= 264\ m^2$

Total height of the tent = 13.5 m

Height of conical part of the tent = total height of tent – height of cylindrical part.

Height of conical part of the tent = 13.5 – 3 m =10.5 m

Let the slant height of the conical part be l

$l^2 = h_{cone}^2 + r^2$

$l^2 = 10.5^2 + 14^2 = 110.25 + 196\ m^2 = 306.25\ m^2$

l = 17.5 m

Curved surface area of conical part of tent = πrl

$= 22/7 \times 14 \times 17.5\ m^2$

$= 770\ m^2$

Total surface area of tent = Curved surface area of cylindrical part of tent + Curved surface area of conical part of tent

Total Surface area of tent = $264\ m^2 + 770\ m^2 = 1034\ m^2$

Cloth required = Total Surface area of tent = $1034\ m^2$

Cost of cloth = Rs $80/m^2$

Total cost of cloth required = Total surface area of tent × Cost of cloth

= 1034 × Rs 80

= Rs 82720

Cost of cloth required to make the tent is Rs 82720

Question: 11

A circus tent is

Solution:

The Circus tent is made as a combination of cylinder and cone on top.

Height of cylindrical part of tent = h = 3 m

Base radius of tent = r = 52.5 m

Area of canvas required for cylindrical part of tent = $2\pi rh$

$= 2 \times 22/7 \times 52.5 \times 3\ m^2$

$= 990\ m^2$

Slant height of cone = l = 53 m

Area of canvas required for conical part of the tent = πrl

$= 22/7 \times 52.5 \times 53\ m^2$

$= 8745\ m^2$

Area of canvas required to make the tent = Area of canvas required for cylindrical part of tent + Area of canvas required for conical part of tent

Area of canvas required to make the tent = $990 + 8745\ m^2 = 9735\ m^2$

Question: 12

A rocket is in th

Solution:

The rocket is in the form of cylinder closed at the bottom and cone on top.

Height of cylindrical part rocket = h = 21 m

Base radius of rocket = r = 2.5 m

Surface Area of cylindrical part of rocket = $2\pi rh + \pi r^2$

$= 2 \times 22/7 \times 2.5 \times 21 + 22/7 \times 2.5 \times 2.5\ m^2$

$= 330 + 19.64\ m^2 = 349.64\ m^2$

Slant height of cone = l = 8 m

Surface Area of conical part of the rocket = πrl

$= 22/7 \times 2.5 \times 8\ m^2$

$= 62.86\ m^2$

Total surface area of the rocket = Surface Area of cylindrical part of rocket + Surface Area of conical part of rocket

Total surface area of the rocket = $349.64 + 62.86\ m^2 = 412.5\ m^2$

Question: 13

A solid is in the

Solution:

The solid is in the form of a cone surmounted on a hemisphere.

Total height of solid = h = 9.5 m

Radius of Solid = r = 3.5 m

Volume of hemispherical part solid = $2/3 \times \pi r^3$

$= 2/3 \times 22/7 \times 3.5^3\ m^3$

$= 89.83\ m^3$

Height of conical part of solid = h_{cone} = Total height of solid – Radius of solid

Height of conical part of solid = $h_{cone} = 9.5 – 3.5 = 6$ m

Volume of conical part of solid = $1/3 \times \pi r^2 h_{cone}$

$= 1/3 \times 22/7 \times 3.5^2 \times 6\ m^3$

$= 77\ m^3$

Volume of solid = Volume of hemispherical part solid + Volume of conical part solid

Volume of solid = $89.83 + 77\ m^3 = 166.83\ m^3$

Question: 14

A toy is in the f

Solution:

The toy is in the form of a cone mounted on a hemisphere.

Total height of toy = h = 31 cm

Radius of toy = r = 7 cm

Surface area of hemispherical part toy = $2\pi r^2$

$= 2 \times 22/7 \times 7^2\ cm^2$

$= 308\ cm^2$

Height of conical part of toy = h_{cone} = Total height of toy – Radius of toy

Height of conical part of toy = $h_{cone} = 31 - 7 = 24$ cm

Let the slant height of the conical part be l

$l^2 = h_{cone}^2 + r^2$

$l^2 = 24^2 + 7^2 = 576 + 49\ cm^2 = 625\ cm^2$

l = 25 cm

Surface area of conical part of toy = πrl

$= 22/7 \times 7 \times 25\ cm^2$

$= 550\ cm^2$

Total surface area of toy = Surface area of hemispherical part of toy + Surface area of conical part of toy

Total Surface area of toy = $308\ cm^2 + 550\ cm^2 = 858\ cm^2$

Question: 15

A toy is in the s

Solution:

A toy is in the shape of a cone mounted on a hemisphere of same base radius.

Volume of Toy = $231\ cm^3$

Base Diameter of toy = 7 cm

Base radius of toy = 7/2 cm = 3.5 cm

Volume of hemisphere = $2/3\ \pi r^3$

$= 2/3 \times 22/7 \times 3.5^3\ cm^3$

$$= \frac{2 \times 22 \times 35 \times 35 \times 35}{3 \times 7 \times 10 \times 10 \times 10}$$

$$= \frac{539}{6}$$

Volume of cone = Volume of hemisphere – Volume of toy

$$= 231 - \frac{539}{6}$$

$$= \frac{1386 - 539}{6}$$

$$= \frac{847}{6}$$

Volume of cone is given by 1/3 $\pi r^2 h$

Where h is the height of cone

$$\Rightarrow \frac{1}{3}\pi r^2 h = \frac{847}{6}$$

$$\Rightarrow \frac{22}{7}\left(\frac{7}{2}\right)^2 h = \frac{847}{2}$$

$$\Rightarrow \frac{77}{2}h = \frac{747}{2}$$

$$\Rightarrow h = 11$$

Height of cone = 11 cm

Height of toy = Height of cone + Height of hemisphere

= 11 cm + 3.5 cm = 14.5 cm

[Height of hemisphere = Radius of hemisphere]

∴ Height of toy is 14.5 cm.

Question: 16

A cylindrical con

Solution:

Radius of cylindrical container = r = 6 cm

Height of cylindrical container = h = 15 cm

Volume of cylindrical container = $\pi r^2 h$

= 22/7 × 6 × 6 × 15 cm^3

= 1697.14 cm^3

Whole ice-cream has to be distributed to 10 children in equal cones with hemispherical tops.

Let the radius of hemisphere and base of cone be r'

Height of cone = h = 4 times the radius of its base

h' = 4r'

Volume of Hemisphere = 2/3 $\pi(r')^3$

Volume of cone = 1/3 $\pi(r')^2 h'$ = 1/3 $\pi(r')^2$ × 4r'

= 2/3 $\pi(r')^3$

Volume of ice-cream = Volume of Hemisphere + Volume of cone

= 2/3 $\pi(r')^3$ + 4/3 $\pi(r')^3$ = 6/3 $\pi(r')^3$

Number of ice-creams = 10

∴ total volume of ice-cream = 10 × Volume of ice-cream

= 10 × 6/3 $\pi(r')^3$ = 60/3 $\pi(r')^3$

Also, total volume of ice-cream = Volume of cylindrical container

⇒ $60/3\ \pi(r')^3 = 1697.14\ cm^3$

⇒ $60/3 \times 22/7 \times (r')^3 = 1697.14\ cm^3$

⇒ $(r')^3 = 1697.14 \times 3/60 \times 7/22 = 27\ cm^3$

⇒ r = 3 cm

∴ Radius of ice-cream cone = 3 cm

Question: 17

A vessel is in th

Solution:

Vessel is in the form of a hemispherical bowl surmounted by a hallow cylinder.

Diameter of hemisphere = 21 cm

Radius of hemisphere = 10.5 cm

Volume of hemisphere = $2/3\ \pi r^3 = 2/3 \times 22/7 \times 10.5^3\ cm^3$

$= 2425.5\ cm^3$

Total height of vessel = 14.5 cm

Height of cylinder = h = Total height of vessel - Radius of hemisphere

= 14.5 – 10.5 cm = 4 cm

Volume of cylinder = $\pi r^2 h = 22/7 \times 10.5 \times 10.5 \times 4\ cm^3$

$= 1386\ cm^3$

Volume of vessel = Volume of hemisphere + Volume of cylinder

$= 2425.5\ cm^3 + 1386\ cm^3$

$= 3811.5\ cm^3$

∴ Capacity of vessel = $3811.5\ cm^3$

Question: 18

A toy is in the f

Solution:

Toy is in the form of a cylinder with hemisphere ends

Total length of toy = 90 cm

Diameter of toy = 42 cm

Radius of toy = r = 21 cm

Length of cylinder = l = Total length of toy – 2 × Radius of toy

= 90 – 2 × 21 cm = 48 cm

For cost of painting we need to find out the curved surface area of toy

Curved surface area of cylinder = $2\pi rl$

$= 2 \times 22/7 \times 21 \times 48\ cm^2$

$= 6336\ cm^2$

Curved surface area of hemispherical ends = $2 \times 2\pi r^2$

$= 2 \times 2 \times 22/7 \times 21 \times 21\ cm^2$

$= 5544\ cm^2$

Surface area of toy = Curved surface area of cylinder + Curved surface area of hemispherical ends

Surface area of toy = $6336\ cm^2 + 5544\ cm^2 = 11880\ cm^2$

Cost of painting = Rs $0.70/cm^2$

Total Cost of painting = Surface area of toy × Cost of painting

$= 11880\ cm^2 \times$ Rs $0.70/cm^2$ = Rs 8316.00

Total cost of painting the toy = Rs 8316.00

Question: 19

A medicine capsul

Solution:

A medicine capsule is in the shape of a cylinder with two hemisphere stuck to each of its ends.

Total length of entire capsule = 14 mm

Diameter of capsule = 5 mm

Radius of capsule = r = Diameter ÷ 2 = 5/2 mm = 2.5 mm

Length of cylindrical part of capsule = l = Total length of entire capsule – 2 × Radius of capsule

$= 14 – 2 \times 2.5$ mm = 14 - 5 mm = 9 mm

Curved surface area of cylindrical part of capsule = $2\pi rl$

$= 2 \times 3.14 \times 9 \times 2.5\ mm^2$

$= 141.3\ mm^2$

Curved surface area of hemispherical ends = $2 \times 2\pi r^2$

$= 2 \times 2 \times 3.14 \times 2.5 \times 2.5\ cm^2$

$= 78.5\ mm^2$

Surface area of capsule = Curved surface area of cylindrical part of capsule + Curved surface area of hemispherical ends

Surface area of capsule = $141.3\ mm^2 + 78.5\ mm^2 = 219.8\ mm^2$

Question: 20

A wooden article

Solution:

The wooden article was made by scooting out a hemisphere from each end of a cylinder

Let the radius of cylinder be r cm and height be h cm.

Height of cylinder = h = 20 cm

Base diameter of cylinder = 7 cm

Base radius of cylinder = r = diameter ÷ 2 = 7/2 cm = 3.5 cm

Lateral Surface area of cylinder = $2\pi rh$

$= 2 \times 22/7 \times 3.5 \times 20\ cm^2$

$= 2 \times 22/7 \times 3.5 \times 20\ cm^2$

$= 440\ cm^2$

Since, the wooden article was made by scooting out a hemisphere from each end of a cylinder

∴ Two hemispheres are taken out in total

Radius of cylinder = radius of hemisphere

∴ Radius of hemisphere = 3.5 cm

Lateral Surface area of hemisphere = $2\pi r^2$

$= 2 \times 22/7 \times 3.5 \times 3.5\ cm^2$

$= 77\ cm^2$

Total Surface area of two hemispheres = $2 \times 77\ cm^2 = 154\ cm^2$

Total surface area of the article when it is ready = Lateral Surface area of cylinder + Lateral Surface area of hemisphere

Total surface area of the article when it is ready = $440\ cm^2 + 154\ cm^2$

$= 594\ cm^2$

Question: 21

A solid is in the

Solution:

A solid is in the form of a right circular cone mounted on a hemisphere.

Let r be the radius of hemisphere and cone

Let h be the height of the cone

Radius of hemisphere = r = 2.1 cm

Volume of hemisphere = $2/3\ \pi r^3$

$= 2/3 \times 22/7 \times 2.1 \times 2.1 \times 2.1\ cm^3$

$= 19.404\ cm^3$

Height of cone = h = 4 cm

Radius of cone = r = 2.1 cm

Volume of cone = $1/3\ \pi r^2 h$

$= 1/3 \times 22/7 \times 2.1 \times 2.1 \times 4\ cm^3$

$= 18.48\ cm^3$

Volume of solid = Volume of hemisphere + Volume of cone

$= 19.404\ cm^3 + 18.48\ cm^3 = 37.884\ cm^3$

The solid is placed in a cylindrical tub full of water in such a way that the whole solid is submerged in water, so, to find the volume of water left in the tub we need to subtract volume of solid from cylindrical tub.

Radius of cylinder = r’ = 5 cm

Height of cylinder = h’ = 9.8 cm

Volume of cylindrical tub = $\pi r'^2 h' = 22/7 \times 5 \times 5 \times 9.8\ cm^3$

$= 770\ cm^3$

Volume of water left in the tub = Volume of cylindrical tub – Volume of solid

Volume of water left in the tub = $770\ cm^3 - 37.884\ cm^3 = 732.116\ cm^3$

∴ Volume of water left in the tub is $732.116\ cm^3$

Question: 22

From a solid cyli

Solution:

Height of solid cylinder = h = 8 cm

Radius of solid cylinder = r = 6 cm

Volume of solid cylinder = $\pi r^2 h$

$= 3.14 \times 6 \times 6 \times 8\ cm^3$

$= 904.32\ cm^3$

Curved Surface area of solid cylinder = $2\pi rh$

Height of conical cavity = h = 8 cm

Radius conical cavity = r = 6 cm

Volume of conical cavity = $1/3\ \pi r^2 h$

$= 1/3 \times 3.14 \times 6 \times 6 \times 8\ cm^3$

$= 301.44\ cm^3$

Let l be the slant height of conical cavity

$l^2 = r^2 + h^2$

$\Rightarrow l^2 = (6^2 + 8^2)\ cm^2$

$\Rightarrow l^2 = (36 + 64)\ cm^2$

$\Rightarrow l^2 = 100\ cm^2$

$\Rightarrow l = 10$ cm

Curved Surface area of conical cavity = πrl

Since, conical cavity is hollowed out from solid cylinder, so, volume and total surface area of remaining solid will be found out by subtracting volume and total surface area of conical cavity from volume and total surface area of solid cylinder.

Volume of remaining solid = Volume of solid cylinder – Volume of conical cavity

Volume of remaining solid = $904.32\ cm^3 - 301.44\ cm^3$

$= 602.88\ cm^3$

Total surface area of remaining solid = Curved Surface area of solid cylinder + Curved Surface area of conical cavity + Area of circular base

Total surface area of remaining solid = $2\pi rh + \pi rl + \pi r^2$

$= \pi r \times (2h + l + r)$

$= 3.14 \times 6 \times (2 \times 8 + 10 + 6)\ cm^2$

$= 3.14 \times 6 \times 32\ cm^2$

$= 602.88\ cm^2$

Question: 23

From a solid cyli

Solution:

Height of solid cylinder = h = 2.8 cm

Diameter of solid cylinder = 4.2 cm

Radius of solid cylinder = r = Diameter ÷ 2 = 2.1 cm

Curved Surface area of solid cylinder = 2πrh

$= 2 \times 22/7 \times 2.1 \times 2.8\ cm^2$

$= 2 \times 22/7 \times 2.1 \times 2.8\ cm^2$

$= 36.96\ cm^2$

Height of conical cavity = h = 2.8 cm

Radius conical cavity = r = 2.1 cm

Let l be the slant height of conical cavity

$l^2 = r^2 + h^2$

$\Rightarrow l^2 = (2.8^2 + 2.1^2)\ cm^2$

$\Rightarrow l^2 = (7.84 + 4.41)\ cm^2$

$\Rightarrow l^2 = 12.25\ cm^2$

$\Rightarrow l = 3.5$ cm

Curved Surface area of conical cavity = πrl

$= 22/7 \times 2.1 \times 3.5$

$= 23.1\ cm^2$

Total surface area of remaining solid = Curved surface area of solid cylinder + Curved surface area of conical cavity + Area of circular base

Total surface area of remaining solid = $(36.96 + 23.1 + 22/7 \times 2.1^2)\ cm^2$

$= (36.96 + 23.1 + 13.86)\ cm^2$

$= 73.92\ cm^2$

Question: 24

From a solid cyli

Solution:

Height of solid cylinder = h = 14 cm

Diameter of solid cylinder = 7 cm

Radius of solid cylinder = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm

Volume of solid cylinder = $\pi r^2 h$

$= 22/7 \times 3.5 \times 3.5 \times 14\ cm^3$

$= 539\ cm^3$

Height of conical cavity = h' = 4 cm

Radius conical cavity = r' = 2.1 cm

Volume of conical cavity = $1/3\ \pi r'^2 h'$

$= 1/3 \times 22/7 \times 2.1 \times 2.1 \times 4\ cm^3$

$= 18.48\ cm^3$

Since, there are two conical cavities

∴ Volume of two conical cavities = $2 \times 18.48\ cm^3 = 36.96\ cm^3$

Volume of remaining solid = Volume of solid cylinder – Volume of two conical cavity

Volume of remaining solid = $539\ cm^3 - 36.96\ cm^3$

= 502.04 cm^3

Question: 25

A metallic cylind

Solution:

Height of metallic cylinder = h = 5 cm

Radius of metallic cylinder = r = 3 cm

Volume of solid cylinder = $\pi r^2 h$

= $\pi \times 3 \times 3 \times 5$ cm^3

= 45π cm^3

Height of conical hole = h' = 8/9 cm

Radius conical hole = r' = 3/2 cm

Volume of conical hole = 1/3 $\pi r'^2 h'$

= $1/3 \times \pi \times 3/2 \times 3/2 \times 8/9$ cm^3

= $2/3\ \pi$ cm^3

Volume of metal left in cylinder = Volume of metallic cylinder – Volume of conical hole

Volume of metal left in cylinder = $45\pi - 2/3\ \pi = 133\pi/3$

Ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape = Volume of metal left in cylinder/ Volume of conical hole

Volume of metal left in cylinder : Volume of conical hole = $133\pi/3 : 2/3\ \pi$

Volume of metal left in cylinder: Volume of conical hole = 133: 2

Ratio of the volume of metal left in the cylinder to the volume of metal taken out in conical shape is 339:4

Question: 26

A spherical glass

Solution:

Length of cylindrical neck = l = 7 cm

Diameter of cylindrical neck = 4 cm

Radius of cylindrical neck = r = Diameter ÷ 2 = 4/2 cm = 2 cm

Volume of cylindrical neck = $\pi r^2 l$

= $22/7 \times 2 \times 2 \times 7$ cm^3

= 88 cm^3

Diameter of spherical part = 21 cm

Radius of spherical part = r' = Diameter ÷ 2 = 21/2 cm = 10.5 cm

Volume of spherical part = 4/3 $\pi r'^3$

= $4/3 \times 22/7 \times 10.5 \times 10.5 \times 10.5$ cm^3

= 4851 cm^3

Quantity of water spherical glass vessel with cylindrical neck can hold = Volume of spherical part + Volume of cylindrical neck

Quantity of water spherical glass vessel with cylindrical neck can hold = 4851 cm^3 + 88 cm^3 = 4939 cm^3

Quantity of water spherical glass vessel with cylindrical neck can hold is 4939 cm^3.

Question: 27

The given figure

Solution:

The solid consisting of a cylinder surmounted by a cone at one end a hemisphere at the other.

Length of cylinder = l = 6.5 cm

Diameter of cylinder = 7 cm

Radius of cylinder = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm

Volume of cylinder = $\pi r^2 l$

= 22/7 × 3.5 × 3.5 × 6.5 cm^3

= 250.25 cm^3

Length of cone = l' = 12.8 cm – 6.5 cm = 6.3 cm

Diameter of cone = 7 cm

Radius of cone = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm

Volume of cone = 1/3 $\pi r^2 l'$

= 1/3 × 22/7 × 3.5 × 3.5 × 6.3 cm^3

= 80.85 cm^3

Diameter of hemisphere = 7 cm

Radius of hemisphere = r = Diameter ÷ 2 = 7/2 cm = 3.5 cm

Volume of hemisphere = 2/3 πr^3

= 2/3 × 22/7 × 3.5 × 3.5 × 3.5 cm^3

= 89.83 cm^3

Volume of the solid = Volume of cylinder + Volume of cone + Volume of hemisphere

Volume of solid = 250.25 cm^3 + 80.85 cm^3 + 89.83 cm^3

= 420.93 cm^3

Question: 28

From a cubical pi

Solution:

Length of cubical piece of wood = a = 21 cm

Volume of cubical piece of wood = a^3

= 21 × 21 × 21 cm^3

= 9261 cm^3

Surface area of cubical piece of wood = $6a^2$

= 6 × 21 × 21 cm^2

= 2646 cm^2

Since, a hemisphere is carved out in such a way that the diameter of the hemisphere is equal to the side of the cubical piece.

So, diameter of hemisphere = length of side of the cubical piece

Diameter of hemisphere = 21 cm

Radius of hemisphere = r = Diameter ÷ 2 = 21/2 cm = 10.5 cm

Volume of hemisphere = $2/3\ \pi r^3$

= $2/3 \times 22/7 \times 10.5 \times 10.5 \times 10.5\ cm^3$

= $2425.5\ cm^3$

Surface area of hemisphere = $2\pi r^2$

= $2 \times 22/7 \times 10.5 \times 10.5\ cm^2$

= $693\ cm^2$

A hemisphere is carved out from cubical piece of wood

Volume of remaining solid = Volume of cubical piece of wood – Volume of hemisphere

Volume of remaining solid = $9261 cm^3 - 2425.5\ cm^3 = 6835.5\ cm^3$

Surface area remaining piece of solid = surface area of cubical piece of wood – Area of circular base of hemisphere + Curved Surface area of hemisphere

Surface area remaining piece of solid = $6a^2 - \pi r^2 + 2\pi r^2$

= $(2646 - 22/7 \times 10.5^2 + 693)\ cm^2$

= $2992.5\ cm^2$

Question: 29

A cubical block o

Solution:

Length of side of cubical block = a = 10 cm

Since, a cubical block is surmounted by a hemisphere, so, the largest diameter of hemisphere = 10 cm

Since, hemisphere will be touching the sides of cubical block.

Radius of hemisphere = r = Diameter ÷ 2 = 10/2 cm = 5 cm

Surface area of solid = Surface area of cube – Area of circular part of hemisphere + Curved surface area of hemisphere

Total Surface area of solid = $6a^2 - \pi r^2 + 2\pi r^2 = 6a^2 + \pi r^2$

= $6 \times 10 \times 10\ cm^2 + 3.14 \times 5 \times 5\ cm^2$

= $678.5\ cm^2$

Rate of painting = Rs $5/100\ cm^2$

Cost of painting the total surface area of the solid so formed = Total Surface area of solid × Rate of painting

Cost of painting the total surface area of the solid = Rs 5/100 × 678.5

= Rs 33.925

Question: 30

A toy is in the s

Solution:

The toy is in the shape of a right circular cylinder surmounted by a cone at one end a hemisphere at the other.

Total height of toy = 30 cm

Height of cylinder = h = 13 cm

Radius of cylinder = r = 5 cm

Curved surface area of cylinder = 2πrh

$= 2 \times 22/7 \times 5 \times 13\ cm^2$

Height of cone = h’ = Total height of toy – Height of cylinder – Radius of hemisphere

Height of cone = h’ = 30 cm – 13 cm – 5 cm = 12 cm

Radius of cone = r = Radius of cylinder

Radius of cone = r = 5 cm

Let the slant height of cone be l

$l^2 = h'^2 + r^2$

$\Rightarrow l^2 = 12^2 + 5^2\ cm^2 = 144 + 25\ cm^2 = 169\ cm^2$

$\Rightarrow l = 13$ cm

Curved surface area of cone = πrl

$= 22/7 \times 5 \times 13\ cm^2$

Radius of hemisphere = r = Radius of cylinder

Radius of hemisphere = r = 5 cm

Curved surface area of hemisphere = $2\pi r^2$

$= 2 \times 22/7 \times 5 \times 5\ cm^2$

Surface area of the toy = Surface area of cylinder + Surface area of cone + Surface area of hemisphere

Surface area of toy = $2\pi rh + \pi rl + 2\pi r^2$

$= \pi r\ (2h + l + 2r)$

$= 22/7 \times 5 \times (2 \times 13 + 13 + 2 \times 5)\ cm^2$

$= 22/7 \times 5 \times 49\ cm^2$

$= 770\ cm^2$

Surface area of toy is $770\ cm^2$

Question: 31

The inner diamete

Solution:

Inner diameter of a glass = 7 cm

Inner radius of glass = r = 7/2 cm = 3.5 cm

Height of glass = h = 16 cm

Apparent capacity of glass = $\pi r^2 h$

$= 22/7 \times 3.5 \times 3.5 \times 16\ cm^3$

$= 616\ cm^3$

Volume of the hemisphere in the bottom = $2/3\ \pi r^3$

$= 2/3 \times 22/7 \times 3.5^3\ cm^3$

$= 89.83\ cm^3$

Actual capacity of the class = Apparent capacity of glass – Volume of the hemisphere

Actual capacity of the class = 616 cm^3 – 89.83 cm^3 = 526.17 cm^3

Question: 32

A wooden toy is i

Solution:

The wooden toy is in the shape of a cone mounted on a cylinder

Total height of the toy = 26 cm

Height of conical part = H = 6 cm

Height of cylindrical part = Total height of the toy – Height of conical part

h = 26 cm – 6 cm = 20 cm

Diameter of conical part = 5 cm

Radius of conical part = R = Diameter/2 = 5/2 cm = 2.5 cm

Let L be the slant height of the cone

$L^2 = H^2 + R^2$

$\Rightarrow L^2 = 6^2 + 2.5^2\ cm^2 = 36 + 6.25\ cm^2 = 42.25\ cm^2$

$\Rightarrow L = 6.5$ cm

Diameter of cylindrical part = 4 cm

Radius of cylindrical part = r = Diameter/2 = 4/2 cm = 2 cm

Area to be painted Red = Curved Surface area of cone + Base area of cone – base area of cylinder

Area to be painted Red = $\pi RL + \pi R^2 - \pi r^2 = \pi (RL + R^2 - r^2)$

$= 22/7 \times (2.5 \times 6.5 + 2.5 \times 2.5 - 2 \times 2)\ cm^2$

$= 22/7 \times (16.25 + 6.25 - 4)\ cm^2$

$= 22/7 \times 18.5\ cm^2$

$= 58.143\ cm^2$

Area to be painted White = Curved Surface area of cylinder + Base area of cylinder

Area to be painted White = $2\pi rh + \pi r^2 = \pi r (2h + r)$

$= 22/7 \times 2 \times (2 \times 20 + 2)\ cm^2$

$= 22/7 \times 2 \times (40 + 2)\ cm^2$

$= 22/7 \times 2 \times 42\ cm^2 = 264\ cm^2$

∴ Area to be painted red is 58.143 cm^2 and area to be painted white is 264 cm^2.

Exercise : 19B

Question: 1

The dimensions of

Solution:

Given,

The dimensions of a metallic cuboid = 100 cm × 80 cm × 64 cm

Let’s find out the volume of the cuboid first;

Volume of the cuboid = $l \times b \times h$

$\Rightarrow 100 \times 80 \times 64 = 512000cm^3$

As cuboid is recast into a cube;

So,

Volume of cube = volume of cuboid

$\Rightarrow l^3 = 512000 \Rightarrow l = \sqrt{512000}$

$\Rightarrow l = 80$ cm

Now,

As the length of the side of the cube = 80 cm

The surface area of the cube = $6(l)^2$

= 6 x 80 x 80

= 38400 cm^2

So, the surface area of the cube is 38400 cm^2

Question: 2

A cone of height

Solution:

We have,

The radius of the cone (r) = 5cm and

The height of the cone (h) = 20cm

Let the radius of the sphere be R;

As,

Volume of sphere = Volume of cone

$\Rightarrow \frac{4}{3}\pi R^3 = \frac{1}{3}\pi r^2 h$

$\Rightarrow 4R^3 = 5 \times 5 \times 20$

$\Rightarrow R^3 = \frac{5 \times 5 \times 20}{4} = 125$ cm

$\Rightarrow R = 5$ cm

Diameter of the sphere = 2R = 2 x 5 = 10 cm

So, the diameter of the sphere is 10 cm

Question: 3

Metallic spheres

Solution:

Given,

The radius (r_1) of 1^{st} sphere = 6 cm

Radius of 2^{nd} sphere (r_2) = 8 cm and

Radius f third sphere (r_3) = 10 cm

Let the radius of the resulting sphere be R;

So now we have,

Volume of resulting sphere = Volume of three metallic spheres

$\Rightarrow \frac{4}{3}\pi R^3 = \frac{4}{3}\pi(r_1^3 + r_2^3 + r_3^3)$

$\Rightarrow \frac{4}{3}\pi R^3 = \frac{4}{3}\pi(6^3 + 8^3 + 10^3)$

$\Rightarrow R^3 = 216 + 512 + 1000$

$\Rightarrow R^3 = 1728$

$\Rightarrow R = \sqrt{1728}$

R = 12 cm

So, the radius of the resulting sphere is 12cm.

Question: 4

A solid metal con

Solution:

Let the number of balls formed = n

Since the metal cone is melted to form spherical balls;

So we have;

Volume of metal cone = Total volume of n spherical balls

Volume of cone = n(Volume of 1 spherical ball)

$$\frac{1}{3} \times \pi \times r^2 \times h = n \times \frac{4}{3} \times \pi \times r^3$$

$$\frac{1}{3} \times \pi \times (12)^2 \times 24 = n \times \frac{4}{3} \times \pi \times (3)^3$$

$$(12)^2 \times (24) = n \times 4 \times (3)^3$$

$$3456 = n \times 108$$

$$\Rightarrow \frac{3456}{108} = n$$

n = 32

So, 32 spherical balls can be formed.

Question: 5

The radii of inte

Solution:

We have,

The internal base radius of spherical shell, r_1 = 3 cm,

The external base radius of spherical shell, r_2 = 5 cm and

The base radius of solid cylinder, r = 7 cm

Let the height of the cylinder be h

As,

The hollow spherical shell is melted into a solid cylinder;

So,

Volume of solid cylinder = Volume of spherical shell

$\Rightarrow \pi r^2 h = \frac{4}{3}\pi r_2^3 - \frac{4}{3}\pi r_1^3$

$\Rightarrow \pi r^2 h = \frac{4}{3}\pi(r_2^3 - r_1^3)$

$\Rightarrow r^2 h = \frac{4}{3}(r_2^3 - r_1^3)$

$\Rightarrow 49 \times h = \frac{4}{3}(125-27)$

$\Rightarrow h = \frac{4}{3} \times 9849$

Therefore,

$h = \frac{8}{3}$

So, the height of the cylinder is $\frac{8}{3}$.

Question: 6

The internal and

Solution:

Given,

Internal diameter of the hemisphere = 6 cm

External diameter of the hemisphere = 10 cm

Diameter of cone = 14 cm

So we have,

Internal radius(r) of the hemisphere = 3 cm

External radius(R) of the hemisphere = 5 cm

Radius of cone = 7 cm

Now,

Volume of the hollow hemisphere = Volume of the coneVolume of the hollow hemisphere = $\frac{2}{3} \times \pi \times (R^3 - r^3)$

Volume of the cone = $\frac{1}{3}\pi r^2 h$

So,

$$\Rightarrow \frac{2}{3} \times \pi \times (R^3 - r^3) = \frac{1}{3}\pi r^2 h$$

$$\Rightarrow \frac{2}{3} \times \frac{22}{7} \times (5^3 - 3^3) = \frac{1}{3} \times \frac{22}{7} \times 72 \times h$$

$$\Rightarrow \frac{2}{3} \times \frac{22}{7} \times 98 = \frac{1}{3} \times \frac{22}{7} \times 49 \times h$$

$= 2 \times 98 = 49 \times h$

$\Rightarrow 2 \times \frac{98}{49} = h$

So,

$h = \frac{196}{49} = 4$ cm

Thus, the height of the cone formed is 4 cm.

Question: 7

A copper rode of

Solution:

Given,

Diameter of the copper Rod = 2cm

Length of the Rod = 10 cm

Length of the wire = 10 m = 1000cm

So here we have,

Radius of the copper rod = 1 cm

Let suppose the radius of the wire = r

Volume of the rod = volume of the wire

$\pi r^2 h = \pi r^2 h$

$1 \times 1 \times 10 = 1000 \times r$

$10 = 1000r$

$r = \sqrt{\frac{1}{100}} \Rightarrow r = \frac{1}{10} = 0.1$ cm

The diameter of the wire = 2r = 2 × 0.1 = 0.2 cm

So, the thickness of the wire is 0.2 cm or 2mm.

Question: 8

A hemispherical b

Solution:

Let the required bottles = n

Internal diameter of the hemispherical sphere = 30 cm

Internal Radius of the hemispherical sphere = 15 cm

Diameter of the cylindrical bottle = 5 cm

Radius of the cylindrical bottle = 2.5 cm

Now,

Volume of the hemispherical sphere = $\frac{2}{3}\pi r^3$

$= \frac{2}{3}\pi \times 15 \times 15 \times 15$

$= \pi 10 \times 15 \times 15$

$= 2{,}250\pi$ cm^3

And,

Volume of 1 cylindrical bottle = $\pi r^2 h = \pi \times 2.5 \times 2.5 \times 6 = 37.5\pi$ cm^3

Amount of water in n bottles = Amount of water in bowl

$n \times 37.5\pi = 2{,}250\pi$

$n = \frac{2250}{37.5} = 60$ bottles

So, 60 numbers of bottles are required to empty the bowl.

Question: 9

A solid metallic

Solution:

Given,

Diameter of the sphere = 21 cm

Diameter of the cone = 3.5 cm = $\frac{7}{4}$ cm

Height of the cone = 3 cm

So here we have,

Radius of the sphere = 10.5 cm

Radius of the cone = 1.75 cm

Volume of the sphere = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}$

Volume of the cone = $\frac{1}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times 3$

No of cones = $\frac{\text{volume of the sphere}}{\text{Volume of the cone}}$

$= \frac{\frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}}{\frac{1}{3} \times \frac{22}{7} \times \frac{7}{4} \times \frac{7}{4} \times 3}$

$= \frac{4}{3} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2} \times 3 \times \frac{4}{7} \times \frac{4}{7} \times \frac{1}{3}$

$= 2 \times 7 \times 7 \times 21 \times \frac{2}{7} \times \frac{2}{7} \times 3$

= 504

So,

504 numbers of cones are formed.

Question: 10

A spherical canno

Solution:

Given,

Diameter of cannon ball = 28cm

So the Radius of cannon ball = 14 cm

Volume of cannon ball = $\frac{4}{3}\pi r^3 = \frac{4}{3}\pi \times 14^3$

Radius of the cone = $\frac{35}{2}$ cm

Let the height of cone be h cm.

Volume of cone = $\frac{1}{3}\pi\left(\frac{35}{2}\right)^2 \times h\ cm^3$

Here we have,

$= \frac{4}{3}\pi \times 14^3 = \frac{1}{3}\pi\left(\frac{35}{2}\right)^2 \times h$

$= h = \frac{4}{3}\pi \times 14 \times 14 \times 14 \times \frac{3}{\pi} \times \frac{35}{2} \times \frac{35}{2}$

= h = 35.84 cm

Hence, the height of the cone = 35.84 cm.

Question: 11

A spherical ball

Solution:

Given,

Radius of the spherical ball = 3 cm

After recasting the ball into three spherical balls;

Radius of the first ball = r_1 = 1.5 cm

Radius of the first ball = r_2 = 2 cm

Let the radius of the third ball be r_3 cm.

Then,

Volume of third ball = Volume of spherical ball – volume of 2 small balls

Volume of the third ball = $\frac{4}{3}\pi \times 3^3 - \frac{4}{3}\pi\left(\frac{3}{2}\right)^2 - \frac{4}{3}\pi \times 2^3$

$36\pi - \frac{9\pi}{2} - 32\pi/3cm^3 = 125\pi/6cm^3$

$4/3\pi r^3 = 125\pi/6$

$r^3 = 125\pi \times 3/6 \times 4 \times \pi = 125/8$

$r = \frac{5}{2} = 2.5$ cm

Hence, the radius of the third ball is 2.5cm.

Question: 12

A spherical shell

Solution:

External diameter of shell = 24cm and

Internal diameter of shell = 18cm

So,

External radius of shell = 12 cm and

Internal radius = 9 cm

Volume of lead in the shell = $\frac{4}{3}\pi[12^3 – 9^3]cm^3$

Let the radius of the cylinder be r cm

Height of the cylinder = 37 cm

Volume of the cylinder = $\pi r^2 h = \pi r^2(37)$

$\frac{4}{3}\pi[12^3 – 9^3] = \pi r^2 \times 37$

$\frac{4}{3}\pi \times 999 = \pi r^2 \times 37$

$r^2 = \frac{4}{3} \times \pi \times 999 \times \frac{1}{37}\pi = 36cm^2$

$r = \sqrt{36} = 6cm$

Hence, diameter of the base of the cylinder = 12 cm

Question: 13

A hemisphere of l

Solution:

Volume of hemisphere of radius 9 cm

$= \frac{2}{3} \times \pi \times 9 \times 9 \times 9 cm^3$

Volume of circular cone (height = 72 cm)

$\frac{1}{3} \times \pi \times r^2 \times 72 cm$

Volume of cone = volume of hemisphere

$\frac{1}{3} \times \pi \times r^2 \times 72 = \frac{2}{3}\pi \times 9 \times 9 \times 9$

$r^2 = \frac{2}{3}\pi \times 9 \times 9 \times 9 \times \frac{1}{24}\pi = 20.25$

$r = \sqrt{20.25} = 4.5 cm$

Hence, radius of the base of the cone = 4.5 cm

Question: 14

A spherical ball

Solution:

Diameter of sphere = 21 cm

Hence, radius of the sphere = $\frac{21}{2}$

Volume of sphere = $\frac{4}{3}\pi \times r^3 = \frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}$

Volume of cube = $a^3 = 1^3$

Let the number of cubes formed be n

Volume of sphere = n(volume of cube)

$\frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2} = n \times 1$

$4 \times 22 \times \frac{1}{2} \times \frac{21}{2} \times \frac{21}{2} = n \times 1$

$11 \times 21 \times 21 = n \times 1$

$4851 = n$

So,

Hence, the number of cubes is 4851

Question: 15

How many lead bal

Solution:

Given,

Radius of the sphere = 8 cm

Radius of the ball we made = 1 cm

So,

Volume of sphere (when r = 1 cm) = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times 1 \times 1 \times 1 \times \pi cm^3$

Volume of sphere (when r = 8 cm) = $\frac{4}{3}\pi r^3$

$= \frac{4}{3} \times 8 \times 8 \times 8 \times \pi \text{ cm}^3$

Let the number of balls be n;

Then we have;

$n \times \frac{4}{3} \times 1 \times 1 \times 1 \times \pi = \frac{4}{3} \times 8 \times 8 \times 8 \times \pi$

$n = \frac{4 \times 8 \times 8 \times 8 \times 3}{3 \times 4} = 512$

Hence, the number of lead balls can be made is 512.

Question: 16

A solid sphere of

Solution:

Given,

Radius of sphere = 3 cm

Volume of sphere = $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 3 \times 3 \times 3 \text{cm}^3 = 36\pi \text{ cm}^3$

Radius of small sphere = $\frac{0.6}{2}$ cm = 0.3 cm

Volume of small sphere = $\frac{4}{3} \times \pi \times 0.3 \times 0.3 \times 0.3 \text{cm}^3$

$= \frac{4}{3}\pi \times \frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} \text{ cm}^3$

Let the number of small balls be n;

$n \times \frac{4}{3}\pi \times \frac{3}{10} \times \frac{3}{10} \times \frac{3}{10} = \frac{4}{3} \times \pi \times 3 \times 3 \times 3$

n = 1000

Hence, the number of small balls = 1000

Question: 17

The diameter of a

Solution:

Given,

Diameter of sphere = 42 cm

Radius of sphere = 21 cm

Volume of sphere = $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 21 \times 21 \times 21 \text{ cm}^3$

Diameter of cylindrical wire = 2.8 cm

Radius of cylindrical wire = 1.4 cm

Volume of cylindrical wire = $\pi r^2 h = \pi \times 1.4 \times 1.4 \times h \text{ cm}^3 = 1.96\pi h \text{ cm}^3$

Volume of cylindrical wire = volume of sphere

$1.96\pi h = \frac{4}{3} \times \pi \times 21 \times 21 \times 21$

$h = \frac{\frac{4}{3}\pi \times 21 \times 21 \times 21 \times 1}{1.96 \times 1\pi}$ cm

h = 6300

$h\left(\frac{6300}{100}\right)m = 63$ m

Hence, length of the wire = 63 m

Question: 18

The diameter of a

Solution:

Given,

Diameter of sphere = 18 cm

Length of wire = 108 m = 10800 cm

Radius of copper sphere = $\frac{3600}{100}$ m = 36 m

Volume of sphere = $\frac{4}{3}\pi r^3 = \frac{4}{3} \times \pi \times 9 \times 9 \times 9 cm^3 = 972\pi\ cm^3$

Let the radius of wire be r cm

$= \pi r^2 l = \pi r^2 \times 10800$

But the volume of wire = volume of sphere

$\Rightarrow \pi r^2 \times 10800 = 972\pi$

$r^2 = \frac{972\pi}{10800\pi} = 0.09\ cm^2$

$r = \sqrt{0.09}$ cm = 0.3

Hence, the diameter = 2r = 0.6 cm

Question: 19

A hemispherical b

Solution:

Given,

Internal radius of hemispherical bowl (r_1) = 9 cm

Internal radius of cyclical vessel (r_2) = 6 cm

Let the height of water in the cylindrical vessel be h.

So,

Volume of hemispherical bowl = volume of cylindrical vessel

$$\frac{2}{3}\pi r_1^3 = \pi r_2^3 h$$

$$h = \frac{2}{3}\left(\frac{r_1^3}{r_2^3}\right)$$

$$h = \frac{2}{3} \times \frac{(9)^3}{(6)^2}$$

$$h = \frac{2 \times 729}{3 \times 36}$$

h = 13.5 cm

Hence, height of water in the cylindrical vessel is 13.5 cm

Question: 20

A hemispherical t

Solution:

Given,

Diameter of the hemispherical tank = 3 m

Radius of hemispherical tank = $\frac{3}{2}$ m

Volume of tank = $\frac{2}{3} \times \frac{22}{7} \times \frac{3}{2} \times \frac{3}{2} \times \frac{3}{2} = \frac{99}{14}$ m^3

= $\frac{99000}{14}$ L … ($1m^3$ = 1000L)

Half the tank = $\frac{99000}{14} \times \frac{1}{2} = \frac{99000}{28}$ L

Now,

In 1 sec = $\frac{25}{7}$ L of water is emptied

Required time

$= \frac{\frac{99000}{28}}{\frac{25}{7}} = \frac{99000}{28} \times \frac{7}{25} = \frac{693000}{700}$

= 990 sec

So,

$= \frac{990}{60}$ = 16.5 min

To empty half the tank 16.5 min are required.

Question: 21

The rain water fr

Solution:

Length of the roof = 44 m

Breadth of the roof = 20 m

Diameter of the cylindrical tank = 4 m

Radius of the cylindrical tank = 2 m

Height of the cylindrical tank = 3.5 m

Volume of roof = l x b x h= 44X20 X hvolume of cylinder = $\frac{22}{7}$x2x2x$\frac{35}{10}$

Height of roof = height of rainfallAndVolume of water on roof = Volume of Water in cylindrical tank44X 20 X h = $\frac{22}{7} \times 2$ x 2 x$\frac{35}{10}$44 X 20 X h = $22 \times 2 \times 2 \times \frac{5}{10}$

$880 \times h = 44$ h = $\frac{44}{880} = \frac{1}{20}$h = .05 mh = 5 cm

Question: 22

The rain water fr

Solution:

Given,

Length of the roof = 22 m

Breadth of the roof = 20 m

Diameter of the cylindrical vessel = 2 m

Radius of the cylindrical vessel = 1 m

Height of the cylindrical vessel = 3.5 m

$\frac{4}{5}$ Volume of the rainfall = area of the roof × depth of the rainfall

$\frac{4}{5}\pi r^2 h$ = area of the roof × d

$\frac{4}{5} \times 3.14 \times 1 \times 3.5 = 22 \times 20 \times d$

$\frac{4}{5} \times 11 = 440d$

8.8 = 440d

0.02 = d

d = 0.02 m

So,

The rainfall is 2 cm.

Question: 23

A solid right cir

Solution:

Height of a cone = 60 cm,

Radius of a cone = 30 cmvolume of cone = $\frac{1}{3}\pi r^2 h$Height of cylinder = 180 cm,

Radius of cylinder = 60 cmVolume of cylinder = $\pi r^2 h$Volume of the remaining water = volume of cylinder - volume of cone

$= \pi \times 60 \times 60 \times 180 - \frac{1}{3} \times \pi \times 30 \times 30 \times 60$

= 648000π – 1800π (Taking 1800 as common)

= 18000(36π-π)

$= 18000 \text{ x } 35 \text{ x } \frac{22}{7} = 1.98 \text{ m}^3$

Question: 24

Water is flowing

Solution:

Given,

Diameter of the cylindrical pipe = 2 cmRadius of the cylindrical pipe = 1 mHeight of the cylindrical pipe = 0.4m/s = 40 cm/s

Water flown in 1 sec = 40 cmWater flown in 30 minutes (30 × 60 seconds) = 40 × 60 × 30 m = 72000 cm

Radius of cylindrical tank = 40 cmLet Height be h,As we can see the volume of water which passes through the cylindrical pipe is equal to the volume of water present in the cylindrical tank after half an hour.So,

Volume of water which passes through the cylindrical = volume of water present in the cylindrical tank after half an hour$\pi r^2 h = \pi r^2 h(1)^2 \times 72000 = (40)^2 \times h72000 = 1600 \times hh = 45$ cm

Hence,

The rise in level of water in tank in half an hour will be 45 cm.

Question: 25

Water is flowing

Solution:

Given,

Speed of the water flowing through the pipe, H = 6 km/hr

$= \frac{600000\ cm}{3600\ s} = \frac{500}{3}$ cm/s

Diameter of the pipe = 14 cm

Radius (R) of pipe = $\frac{14}{2}$ = 7 cm

Length (l) of the rectangular tank = 60 m = 6000 cm,

Breadth (b) of the rectangular tank = 22 m = 2200 cm and

Height (h) or Rise in the level of water in the tank = 7 cm

Now,

Volume of the water in rectangular tank = l × b × h = 6000 x 2200 x 7 = 92400000cm3

Also,

Volume of the water flowing through the pipe in 1 s = $\pi R^2 H$

$= \frac{22}{7} \times 7 \times \frac{500}{3} = \frac{77000}{3}$ cm^3

So,

The time taken to rise the water = $\frac{\text{Volume of the water in the rectangular tank}}{\text{Volume of the water flowing through the pipe in 1 sec}}$

$= \left(\frac{92400000}{\frac{7700}{3}}\right)$ cm^3

= 92400 x $\frac{3}{77}$ = 3600s = 1 hr

So,

In 1 hour time the level of water in the tank will rise by 7cm.

Question: 26

Water in a canal,

Solution:

Given,

Width of the canal = 6 m

Depth of the canal, = 1.5 m

Length of the cuboid = 666.67 m

Water is flowing at a speed of 4 km/hr = 4000m/hr

Thus,

Area irrigated in 10 minutes = $\frac{1}{6}$ hour = $\frac{1}{6}$ x 4000 = 666.67 m

Hence,

Volume of the water flowing in $\frac{1}{6}$ hour = Volume of the canal

⇒ Volume of the water flowing in $\frac{1}{6}$ hour = 666.67 x 6 x 1.5 = 6000.03 = 60000 m^3

Let a m^2 is the area irrigated in $\frac{1}{6}$ hour,

Then,

$\Rightarrow a \times \frac{8}{100} = 6000$

$\Rightarrow a = \frac{600000}{8}$ $m^2 = 75000$ m^2

Question: 27

A farmer connects

Solution:

Given,

Internal diameter of the pipe = 25 cm

Radius (r) of the pipe = $\frac{25}{2}$ cm $= \frac{1}{8}$ m

Diameter of the cylindrical tank = 12 m

Radius (R) of the tank = 6 m

Height (h) of the tank = 2.5 m

In 1 hour water comes out of the pipe = 3.6 km = 3600 m

Let the total hrs = n

Volume of the water coming out of the pipe in n hrs = volume of the cylindrical tank

$$n \times \frac{22}{7} \times \frac{1}{8} \times \frac{1}{8} \times 3600 = \frac{22}{7} \times 6 \times 6 \times 2.5$$

$$n \times \frac{1}{8} \times \frac{1}{8} \times 3600 = 6 \times 6 \times 2.5$$

$3600 n = 36 \times 2.5 \times 8 \times 8$

$100 n = 8 \times 8 \times 2.5$

$1000 n = 8 \times 8 \times 25$

$n = \frac{16}{10} = 1.6$ hrs

n = 1 hrs 36 minutes

Now calculate the cost;

Cost of the water = Volume of the cylindrical tank × 0.07

$= \frac{22}{7} \times 6 \times 6 \times 2.5 \times 0.07 = 19.80$ rs

So,

Total time required to fill the tank is 1 hr 36 minutes and the cost is 19.80 rs.

Question: 28

Water running in

Solution:

Given,

Diameter of the cylindrical pipe = 7 cm

Radius of the pipe = 3.5 cm

Volumetric flow rate = 192.5 l/min

Flow rate = $\frac{\text{Volumetric flow rate}}{\text{Area}}$

Area = pi × r^2 = 3.14 × 3.5 × 3.5 = 38.5 cm^2

Since 1 l = 1dm^3 = 1000 cm^3

Volumetric flow rate = 192.5 × 1000 cm^3/min

So,

Flow rate = $\frac{192.5 \times 1000 \text{ cm}^3/\text{min}}{38.5 \text{ cm}^2}$ = 5000 cm/min

Flow rate in km/h = 5000 cm/min = 5000 × 0.00001 km/($\frac{1}{60}$ h) = 3 km/h

Question: 29

150 spherical mar

Solution:

Given,

Diameter of marble = 1.4 cm

Radius of marble = 0.7 cm

Number of marbles = 150

Diameter of cylinder = 7cm

Radius of cylinder = 3.5cm

150 × Volume of spherical marbles = volume of cylindrical vessel⇒ 150 x $\frac{4}{3}$ × π × 0.7 × 0.7 × 0.7 = π × 3.5 × 3.5 × h

⇒ 50 x 4 x $(0.7)^3 = (3.5)^2$ x h

⇒ 200 x 0.343 = 12.25 x h

⇒ $\frac{68.6}{12.25}$ = 5.6 = h

So,

h = 5.6 cm

The rise in the level of water in the vessel (h) = 5.6 cm

Question: 30

Marbles of diamet

Solution:

Given,

Diameter of marble = 1.4 cm

Diameter of cylinder = 7 cm

Radius of cylinder = 3.5 cm

Cylinder height = 5.6 cm

Radius of marble = 0.7 cm

Volume of 1 marble = $\frac{4}{3}\pi r^3$

= $\frac{4}{3} \times \frac{22}{7} \times \frac{22}{7} \times \frac{22}{7}$ = 1.4373

So,

Let the number of marbles be n,

Increase in the Volume of cylinder due to n marbles = $\pi r^2 h$

= 3.14 × 3.5 × 3.5 × 5.6 = 215.6 cm^3

Hence the total numbers of marble required = $\frac{215.6}{1.4373}$ = 150 marbles

Question: 31

In a village, a w

Solution:

Given,

Diameter of the well = 10 m

Radius of the well = 5 mHeight of the well = 14 mWidth of the embankment = 5 mTherefore radius of the embankment = 5 + 5 = 10 mLet h be the height of the embankment,

Hence,

The volume of the embankment = volume of the well

$\pi(R - r)^2h = \pi r^2h(10^2 - 5^2) \times h = 5^2 \times 14(100 - 25) \times h = 25 \times 14h = \frac{25 \times 14}{75} = \frac{14}{3}$Therefore,

The height of the embankment, h = 4.67 m

Question: 32

In a corner of a

Solution:

Given,

Diameter of the well = 14 m

Radius of the well = 7 m

Height of the well = 8 m

Now,

Volume of the earth dug out of the well = $\pi r^2 h$

$= \frac{22}{7} \times 7 \times 7 \times 8 = 1{,}232 \text{ m}^3$

Area on which earth dug out is spread = $l \times b - r^2h$

$= 35 \times 22 - \frac{22}{7} \times 7 \times 7$

= 770 - 154 = 616 m

Level of the earth raised = $\frac{1232}{616}$ = 2 m

So, the rise in the level of the field is 2 m.

Question: 33

A copper wire of

Solution:

Given,

Diameter of the copper wire = 6 mm = 0.6 cm

Radius of the copper wire = 0.3 cm

Length of the cylinder = 18 cm

Diameter of the cylinder = 49 cm

Radius of the cylinder = $\frac{49}{2}$ cm

Density of the copper = 8.8g

Number of the rotations on the cylinder = $\frac{18}{0.6}$ = 30 cm

Base circumference of the cylinder = 2πr = $2 \times \frac{22}{7} \times \frac{49}{2}$ = 154 cm

So,

Length of the wire = 154 × 30 = 4620 cm

Volume of the wire = $\pi r^2 h$

= $\frac{22}{7}$ × 0.3 × 0.3 × 4620 = 1306.8

Weight of the wire = volume × density

= 1306.8 × 8.8 = 11,499.84 gm

Question: 34

A right triangle

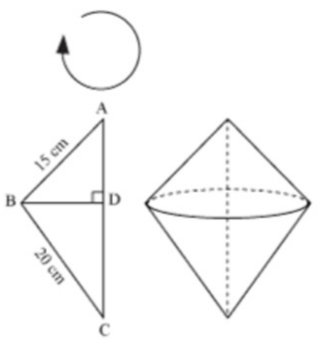
Solution:

Let name the triangle, ABC

Given,

Sides of the triangle are 15 and 20 cm,

BD ⊥ AC.



In the given case BD is the radius of the double cone generated by triangle by revolving.

Now by Pythagoras theorem,

$AC^2 = AB^2 + BC^2$

$AC^2 = (15)^2 + (20)^2$

$AC^2 = 225 + 400$

$AC^2 = 625 = (25)^2$

AC = 25 cm

Let AD be m cm;

∴ CD = (25 – m) cm

By using the Pythagoras theorem in ΔABD and ΔCBD;

ΔABD,

$AD^2 + BD^2 = AB^2$

$m^2 + BD^2 = 225$

$BD^2 = 225 - m^2$ ....(i)

ΔCBD,

$BD^2 + CD^2 = BC^2$

$BD^2 + (25 - m)^2 = (20)^2$

$BD^2 = (20)^2 - (25 - m)^2$ .....(ii)

By putting both the equations (i) and (ii) together,

$225 - m^2 = (20)^2 - (625 - m)^2$

$225 - m^2 = 400 - (625 + m^2 - 50m)$ ....by $(a^2 - b^2)$

$225 - m^2 = - 225 - m^2 + 50m$

$225 - m^2 + 225 + m^2 = 50m$

$450 = 50m$

So,

$m = \frac{450}{50} = 9$ cm

$BD^2 = (15)^2 - (9)^2$

$BD^2 = 225 - 81 = 144$ cm

BD = 12 cm

Radius of the generated double cone = 12 cm

Now,

Volume of the cone generated = Volume of the upper cone + Volume of the lower cone

$\Rightarrow \frac{1}{3}\pi \times BD^2 \times AD + \frac{1}{3}\pi \times BD^2 \times CD$

$\Rightarrow \frac{1}{3}\pi \times BD^2 \times (AD + CD)$

$\Rightarrow \frac{1}{3}\pi\, (12)^2 \times (25)$

$= 1200\pi\ cm^3 = 3{,}771.42\ cm^3$

Surface area of the double cone formed;

= L.S.A of upper cone + L.S.A of the lower cone

$= \pi\, (BD) \times (AB) + \pi\, (BD) \times (BC)$

$= \pi \times 12cm \times 15\ cm + \pi \times 12\ cm \times 20\ cm$

$= 420\pi\ cm^2 = 1320\ cm^2$

So, the volume is $1200\pi\ cm^3$ and surface area is $420\pi\ cm^2$, of the double cone so formed.

Exercise : 19C

Question: 1

A drinking glass

Solution:

Given: Height of glass = h = 14 cm

Diameter of lower circular end of glass = 12 cm

Diameter of upper circular end of glass = 16 cm

∴ Radius of lower circular end = r = 12/2 = 6 cm

∴ Radius of lower circular end = R = 16/2 = 8 cm

$\therefore$ Capacity of drinking glass $= \frac{1}{3} \times \frac{22}{7} \times 14 \times (8^2 + 6^2 + 8 \times 6)$ cm3

$= \frac{44}{3} \times (64 + 36 + 48)\ \text{cm}^3 = \frac{44 \times 148}{3}\ \text{cm}^3$

$= 44 \times 49.33\ \text{cm}^3$

$= 2170.52\ \text{cm}^3$

$\therefore$ Capacity of glass = $2170.52\ \text{cm}^3$

Question: 2

The radii of the

Solution:

Given: Radius of lower circular end = r = 12 cm

Radius of upper circular end = R = 18 cm

Height of frustum = h = 8 cm

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ \text{cm}^2$

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h^2}$ cm

$\therefore l = \sqrt{(18-12)^2 + 8^2} = \sqrt{36 + 64} = 10$ cm

$\therefore$ l = 10 cm

$\therefore$ total surface area of frustum = $\pi \times 12^2 + \pi \times 18^2 + \pi \times (18 + 12) \times 10\ \text{cm}^2$

$= 3.14 \times (144 + 324 + 300)\ \text{cm}^2$

$= 3.14 \times 768\ \text{cm}^2$

$= 2411.52\ \text{cm}^2$

$\therefore$ total surface area of frustum = $2411.52\ \text{cm}^2$

Question: 3

A metallic bucket

Solution:

Given: Height of bucket = h = 24 cm

Radius of lower circular end = r = 7 cm

Radius of upper circular end = R = 14 cm

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ \text{cm}^3$

Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ \text{cm}^2$

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h^2}$ cm

$\therefore l = \sqrt{(14-7)^2 + 24^2} = \sqrt{49 + 576} = 25$ cm

$\therefore$ l = 25 cm

(i) volume of water which will completely fill the bucket = volume of frustum

$\therefore$ Volume of frustum of cone $= \frac{1}{3}\pi \times 24 \times (14^2 + 7^2 + 14 \times 7)$

$= 8 \times \frac{22}{7} \times (343)$

$= 8 \times 22 \times 49$

$= 8722\ cm^3$

$\therefore$ volume of water which will completely fill the bucket $= 8722\ cm^3$

(ii) area of metal sheet used

Since the top is open we need to subtract the area of top/upper circle from total surface area of frustum because we don't require a metal plate for top.

Radius of top/upper circle = R

Area of upper circle $= \pi R^2$

$\therefore$ area of metal sheet used = (total surface area of frustum)-πR^2

$\therefore$ Area of metal sheet used $= \pi r^2 + \pi R^2 + \pi(R + r)l - \pi R^2 cm^2$

$= \pi r^2 + \pi(R + r)l\ cm^2$

$= \frac{22}{7} \times (7^2 + (7 + 14) \times 25) = \frac{22}{7} \times (574)\ cm^2$

$= 22 \times 82\ cm^2$

$= 1804\ cm^2$

$\therefore$ Area of metal sheet used to make bucket $= 1804\ cm^2$

Question: 4

A container, open

Solution:

Given: height of frustum container = h = 24 cm

Radius of lower circular end = r = 8 cm

Radius of upper circular end = R = 20 cm

Cost of 1 litre milk = 24 Rs

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Volume of milk completely fill the container = volume of frustum of cone

$= \frac{1}{3} \times \pi \times 24 \times (20^2 + 8^2 + 20 \times 8)\ cm^3$

$= 8 \times 3.14 \times (400 + 64 + 160)\ cm^3$

$= 8 \times 3.14 \times 624\ cm^3$

$= 15674.88\ cm^3$

Now, 1 litre is $1000\ cm^3$

$\therefore 15674.88\ cm^3 = 15674.88/1000 = 15.67488$ litres

$\therefore$ Cost of milk which can completely fill the container $= 15.67488 \times$ cost of 1 litre milk

$= 15.67488 \times 24$ Rs

$= 376.19712$ Rs

∴ Cost of milk which can completely fill the container = 376.19712 Rs

Question: 5

A container, open

Solution:

Given: height of container frustum = h = 16 cm

Diameter of lower circular end = 16 cm

Diameter of upper circular end = 14 cm

∴ Radius of lower circular end = r = 16/2 = 8 cm

∴ Radius of upper circular end = R = 14/2 = 7 cm

Cost of 100 cm^2 metal sheet = 10 Rs

∴ Cost of 1 cm^2 metal sheet = 10/100 = 0.1 Rs

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l$ cm^2

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h^2}$ cm

∴ $l = \sqrt{(7-8)^2 + 16^2} = \sqrt{1 + 256} = 16.0312$ cm

∴ l = 16.0312 cm

Since the top is open we need to subtract the area of top/upper circle from total surface area of frustum because we don’t require a metal plate for top.

Radius of top/upper circle = R

Area of upper circle = πR^2

∴ area of metal sheet used = (total surface area of frustum)-πR^2

= $\pi r^2 + \pi R^2 + \pi(R + r)l - \pi R^2$ cm^2

= $\pi r^2 + \pi(R + r)l$ cm^2

= $\pi \times (8^2 + (7 + 8)16.0312)$ cm^2

= 3.14×304.468 cm^2

= 956.029 cm^2

∴ 956.029 cm^2 metal sheet is required to make the container.

∴ Cost of 956.029 cm^2 metal sheet = 956.029 × cost of 1 cm^2 metal sheet

= 956.029 × 0.1 Rs

= 95.6029 Rs

∴ Cost of metal sheet required to make container = 95.6029 Rs

Question: 6

The radii of the

Solution:

Given: Radius of lower circular end = r = 27 cm

Radius of upper circular end = R = 33 cm

Slant height = l = 10cm

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ cm^2$

Here h height of frustum is not given and we need h to find the volume of frustum therefore we must first calculate the value of h as follows

slant height $= l = \sqrt{(R-r)^2 + h^2}$ cm

using formula for slant height and with the help of given data we get

$10 = \sqrt{(33-27)^2 + h^2}$

Squaring both sides

$\therefore 100 = 36 + h^2$

$\therefore h^2 = 64$

$\therefore h = \pm 8$

As length cannot be negative

$\therefore h = 8$ cm

Volume of frustum of cone $= \frac{1}{3} \times \frac{22}{7} \times 8 \times (33^2 + 27^2 + 33 \times 27)$

$= \frac{22}{21} \times 8 \times (1089 + 729 + 891)$

$= 22 \times 8 \times 129$

$= 22704\ cm^3$

$\therefore$ capacity = volume of frustum = $22704\ cm^3$

Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ cm^2$

$= \frac{22}{7} \times (33^2 + 27^2 + (33 + 27) \times 10)$

$= (22/7) \times (1089 + 729 + 600)$

$= (22/7) \times 2418$

$= 7599.428\ cm^2$

$\therefore$ total surface area = $7599.428\ cm^2$

Question: 7

A bucket is in th

Solution:

Given: Depth of the bucket = height of frustum = h = 15 cm

Diameter of top of bucket = 56 cm

Diameter of bottom of bucket = 42 cm

$\therefore$ Radius of top = R = 56/2 = 28 cm

$\therefore$ Radius of bottom = r = 42/2 = 21 cm

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Volume of water bucket can hold = volume of bucket which is in form of frustum

∴ volume of water bucket can hold

$$= \frac{1}{3} \times \frac{22}{7} \times 15 \times (28^2 + 21^2 + 28 \times 21)\ cm^3$$

= (22/7) × 5 × (784 + 441 + 588) cm^3

= (22/7) × 5 × 1813 cm^3

= 22 × 5 × 259 cm^3

= 28490 cm^3

Now 1 litre = 1000 cm^3

∴ 28490 cm^3 = 28490/1000 litres

= 28.49 litres

∴ bucket can hold 28.49 litres of water

Question: 8

A bucket made up

Solution:

Given: height of container frustum = h = 16 cm

Radius of lower circular end = r = 8 cm

Radius of upper circular end = R = 20 cm

Cost of 100 cm^2 metal sheet = 15 Rs

∴ Cost of 1 cm^2 metal sheet = 15/100 = 0.15 Rs

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ cm^2$

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h^2}$ cm

∴ $l = \sqrt{(20-8)^2 + 16^2} = \sqrt{144 + 256} = 20$ cm

∴ l = 20 cm

Since it is given that a bucket is to be made hence the top is open we need to subtract the area of top/upper circle from total surface area of frustum because we don’t require a metal plate for top.

Radius of top/upper circle = R

Area of upper circle = πR^2

∴ area of metal sheet used = (total surface area of frustum)-πR^2

= $\pi r^2 + \pi R^2 + \pi(R + r)l - \pi R^2\ cm^2$

= $\pi r^2 + \pi(R + r)l\ cm^2$

= $\pi \times (8^2 + (20 + 8)20)\ cm^2$

= 3.14 × 624 cm^2

= 1959.36 cm^2

∴ 1959.36 cm^2 metal sheet is required to make the container.

∴ Cost of 1959.36 cm^2 metal sheet = 1959.36 × cost of 1 cm^2 metal sheet

= 1959.36 × 0.15 Rs

= 293.904 Rs

∴ Cost of metal sheet required to make container = 293.904 Rs

Question: 9

A bucket made up

Solution:

Given: depth of bucket = height of bucket/frustum = h = 24 cm

Diameter of lower circular end = 10 cm

Diameter of upper circular end = 30 cm

∴ Radius of lower circular end = r = 10/2 = 5 cm

∴ Radius of lower circular end = R = 30/2 = 15 cm

Cost of 100 cm^2 metal sheet = 10 Rs

∴ Cost of 1 cm^2 metal sheet = 10/100 = 0.1 Rs

Cost of 1 litre milk = 20 Rs

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ cm^2$

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h^2}$ cm

$\therefore\ l = \sqrt{(15-5)^2 + 24^2} = \sqrt{100 + 576} = 26$ cm

∴ l = 26 cm

Since the top is open we need to subtract the area of top/upper circle from total surface area of frustum because we don't require a metal plate for top.

Radius of top/upper circle = R

Area of upper circle = πR^2

∴ area of metal sheet used = (total surface area of frustum)-πR^2

$= \pi r^2 + \pi R^2 + \pi(R + r)l - \pi R^2\ cm^2$

$= \pi r^2 + \pi(R + r)l\ cm^2$

$= \pi \times (5^2 + (15 + 5)26)\ cm^2$

$= 3.14 \times 545\ cm^2$

$= 1711.3\ cm^2$

∴ 1711.3 cm^2 metal sheet is required to make the container.

∴ Cost of 1711.3 cm^2 metal sheet = 1711.3 × cost of 1 cm^2 metal sheet

= 1711.3 × 0.1 Rs

= 171.13 Rs

∴ Cost of metal sheet required to make container = 171.13 Rs

Now,

Volume of milk which can completely fill the bucket = volume of frustum

$\therefore$ volume of milk $= \frac{1}{3} \times 3.14 \times 26 \times (15^2 + 5^2 + 15 \times 5)\ cm^3$

$= (1/3) \times 3.14 \times 26 \times 325\ cm^3$

$= 26533/3\ cm^3$

$= 8844.33\ cm^3$

Now 1 litre = 1000 cm^3

∴ 8844.33 cm^3 = 8844.33/1000 litres

= 8.84433 litres

∴ Volume of milk which can completely fill the bucket = 8.84433 litres

∴ Cost of milk which can completely fill the bucket = volume of milk which can completely

fill the bucket × cost of 1 litre milk Rs

= 8.84433 × 20 Rs

= 176.8866 Rs

Cost of milk which can completely fill the bucket = 176.8866 Rs

Question: 10

A container in th

Solution:

Given: height of container/frustum = h = 14 cm

Diameter of top of container = 35 cm

Diameter of bottom of container = 30 cm

∴ Radius of top = R = 35/2 = 17.5 cm

∴ Radius of bottom = r = 30/2 = 15 cm

1 cm^3 of oil = 1.2g of oil

Cost of 1 kg oil = 40 Rs

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Volume of oil in container = volume of container which is in form of frustum

∴ volume of oil in container

$$= \frac{1}{3} \times \frac{22}{7} \times 14 \times (17.5^2 + 15^2 + 17.5 \times 15)\ cm^3$$

= (22/3) × 2 × (306.25 + 225 + 262.5) cm^3

= (22/3) × 2 × 793.75 cm^3

= 34925/3 cm^3

= 11641.667 cm^3

∴ Volume of oil in container = 11641.667 cm^3

∴ 11641.667 cm^3 of oil = 11641.667 × 1.2 g

= 13970.0004 g

We know 1000 g = 1 kg

∴ 13970.0004 g = 13970.0004/1000 kg

= 13.970 kg

∴ Cost of 13.970 kg oil = 13.970 × cost of 1 kg oil Rs

= 13.970 × 40 Rs

= 558.8 Rs

∴ Cost of oil in container = 558.8 Rs

Question: 11

A bucket is in th

Solution:

Given: volume of bucket = 28.49 litres

1 litre = 1000 cm^3

∴ 28.49 litres = 28.49 × 1000 cm^3

∴ Volume of bucket = 28490 cm^3

Radius of upper circular end = R = 28 cm

Radius of lower circular end = r = 21 cm

Let 'h' be the height of the bucket

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Volume of bucket = volume of frustum of cone

$\therefore\ 28490 = \frac{1}{3} \times \frac{22}{7} \times h \times (28^2 + 21^2 + 28 \times 21)$

∴ 28490 × 21 = h × 22 × (784 + 441 + 588)

∴ h = 598290/39886 cm

∴ h = 15 cm

∴ Height of bucket = h = 15 cm

Question: 12

The radii of the

Solution:

Given: volume of bucket = 5390 cm^3

Radius of upper circular end = R = 14 cm

Radius of lower circular end = r cm & r is less than 14

Height of bucket = h = 15

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)\ cm^3$

Volume of bucket = volume of frustum of cone

$\therefore\ 5390 = \frac{1}{3} \times \frac{22}{7} \times 15 \times (14^2 + r^2 + 14 \times r)$

∴ 5390 × 7 = 22 × 5 × (196 + r^2 + 14r)

∴ 37730/110 = 196 + r^2 + 14r

∴ 343 = 196 + r^2 + 14r

∴ r^2 + 14r-147 = 0

∴ r^2 + 21r-7r-147 = 0

∴ r(r + 21)-7(r + 21) = 0

∴ (r-7)(r + 21) = 0

$\therefore$ r = 7 or r = -21

Since we require r<14 $\therefore$ r = 7 cm

Question: 13

The radii of the

Solution:

Given: Radius of lower circular end = r = 27 cm

Radius of upper circular end = R = 33 cm

Slant height = l = 10cm

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l\ cm^2$

$= 3.14 \times (33^2 + 27^2 + (33 + 27) \times 10)\ cm^2$

$= 3.14 \times (1089 + 729 + 600)\ cm^2$

$= 3.14 \times 2418\ cm^2$

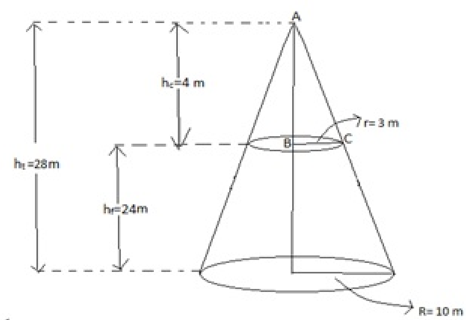
$= 7592.52\ cm^2$

$\therefore$ total surface area = $7592.52\ cm^2$

Question: 14

A tent is made in

Solution:



Given: Diameter of base of frustum = 20 m

Diameter of top of frustum = 6 m

$\therefore$ Radius of base = R = 20/2 = 10 m

$\therefore$ Radius of top = r = 6/2 = 3 m

Height of frustum = h_f = 24 m

Height of tent = h_t = 28 m

$\therefore$ height of cone = $h_c = h_t - h_f$ = 28-24 = 4 m

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l_f\ m^2$

Total surface area of cone = $\pi r l_c$

Where l_f = slant height of frustum & l_c = slant height of cone

For slant height of frustum we have $l_f = \sqrt{(R-r)^2 + {h_f}^2}$ m

$\therefore\ l_f = \sqrt{(10-3)^2 + 24^2} = \sqrt{49 + 576} = 25$ m

$\therefore$ l_f = 25 m

For slant height of cone consider right angled ΔABC from figure

$AB = h_c = 4$ m ; $BC = r = 3$ m ; $AC = l_c$

By pythagoras theorm

$AB^2 + BC^2 = AC^2$

$\therefore 4^2 + 3^2 = l_c^2$

$\therefore l_c = \pm 5$

Since length cannot be negative $l_c = 5$ m

Since for tent we don't require the upper circle of frustum and the lower circle of frustum hence we should subtract their area as we don't require canvas for that.

Surface area of upper circle = πr^2

Surface area of lower circle = πR^2

∴ Surface area of frustum for which canvas is required = $\pi r^2 + \pi R^2 + \pi(R + r)l_f - \pi r^2 - \pi R^2 cm^2$

$= \pi(R + r)l_f m^2$

$= (22/7) \times (10 + 3) \times 25\ m^2$

$= (22/7) \times 325\ m^2$

$= 1021.4285\ m^2$

Surface area of cone = $\pi r l_c\ m^2$

$= (22/7) \times 3 \times 5\ m^2$

$= (22/7) \times 15\ m^2$

$= 47.1428\ m^2$

∴ Quantity of canvas required = surface area of frustum + surface area of cone

$= 1021.4285 + 47.1428\ m^2$

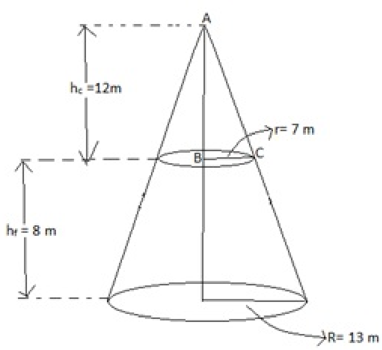
$= 1068.5713\ m^2$

∴ Quantity of canvas required = $1068.5713\ m^2$

Question: 15

A tent consists o

Solution:



Given: Diameter of base of frustum = 26 m

Diameter of top of frustum = 14 m

∴ Radius of base = R = 26/2 = 13 m

∴ Radius of top = r = 14/2 = 7 m

Height of frustum = h_f = 8 m

∴ height of cone = h_c = 12 m

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l_f\ m^2$

Total surface area of cone = $\pi r l_c$

Where l_f = slant height of frustum & l_c = slant height of cone

For slant height of frustum we have $l_f = \sqrt{(R-r)^2 + {h_f}^2}$ m

$\therefore\ l_f = \sqrt{(13-7)^2 + 8^2} = \sqrt{36 + 64} = 10$ m

∴ l_f = 10 m

Consider right angled ΔABC from figure

AB = h_c = 12 m ; BC = r = 7 m ; AC = l_c

By pythagoras theorm

$AB^2 + BC^2 = AC^2$

$\therefore\ 12^2 + 7^2 = {l_c}^2$

∴ $l_c = \pm 13.892$

Since length cannot be negative l_c = 13.892 m

Since for tent we don't require the upper circle of frustum and the lower circle of frustum hence we should subtract their area as we don't require canvas for that.

Surface area of upper circle = πr^2

Surface area of lower circle = πR^2

∴ Surface area of frustum for which canvas is required = $\pi r^2 + \pi R^2 + \pi(R + r)l_f - \pi r^2 - \pi R^2 cm^2$

$= \pi(R + r)l_f m^2$

$= 3.14 \times (13 + 7) \times 10\ m^2$

$= 3.14 \times 200\ m^2$

$= 628\ m^2$

Surface area of cone = $\pi r l_c\ m^2$

$= 3.14 \times 7 \times 13.892\ m^2$

$= 3.14 \times 97.244\ m^2$

$= 305.346\ m^2$

∴ Quantity of canvas required = surface area of frustum + surface area of cone

$= 628 + 305.346\ m^2$

$= 933.346\ m^2$

∴ Quantity of canvas required = $933.346\ m^2$

Question: 16

The perimeters of

Solution:

Given: perimeter of upper circle = 36 cm

Perimeter of lower circle = 48 cm

Height of frustum = h = 11 cm

Let r: radius of upper circle & R: radius of lower circle

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)$ cm^3

Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l$ cm^2

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h^2}$ cm

Now perimeter of circle = circumference of circle = 2π × radius

∴ Perimeter of upper circle = 2πr

∴ 36 = 2 × 3.14 × r

∴ r = 36/6.28 cm

∴ r = 5.732 cm

∴ Perimeter of lower circle = 2πR

∴ 48 = 2 × 3.14 × R

∴ R = 48/6.28 cm

∴ R = 7.643 cm

∴ $l = \sqrt{(7.643-5.732)^2 + 11^2} = \sqrt{3.651 + 121} = 11.164$ cm

∴ l = 11.164 cm

∴ Volume of frustum = (1/3) × 3.14 × 11 × ($7.643^2 + 5.732^2$ + 7.643 × 5.732) cm^3

= (1/3) × 34.54 × (58.415 + 32.855 + 43.809) cm^3

= 11.513 × 135.079 cm^3

= 1555.164 cm^3

∴ Volume of frustum = 1555.164 cm^3

Now we have asked curved surface area so we should subtract the top and bottom surface areas which are flat circles.

Surface area of top = πr^2

Surface area of bottom = πR^2

∴ Curved surface area = total surface area - πr^2 - πR^2 cm^2

= $\pi r^2 + \pi R^2 + \pi(R + r)l - \pi r^2 - \pi R^2$ cm^2

= $\pi(R + r)l$ cm^2

= 3.14 × (7.643 + 5.732) × 11.164 cm^2

= 3.14 × 13.375 × 11.164 cm^2

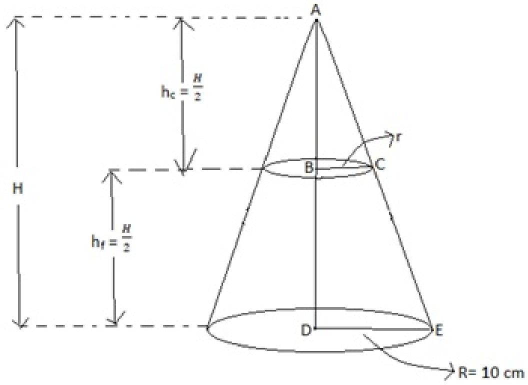
= 468.86 cm^2

∴ curved surface area = 468.86 cm^2

Question: 17

A solid cone of b

Solution:



Let 'H' be the height of cone 'R' be the radius of base of cone.

R = 10 cm

When the cone is cut at midpoint of H by a plane parallel to its base we get a cone of height H/2 and a frustum also of height H/2

Let the radius of the base of the cone which we got after cutting and the radius of upper circle of frustum be 'r' as shown in figure

From figure consider ΔABC and ΔADE

∠ABC = ∠ADE = 90˚

∠BAC = ∠DAE ...(common angle)

as two angles are equal by AA criteria we can say that

ΔABC~ΔADE

$$\therefore \frac{BC}{DE} = \frac{AB}{AD} \Rightarrow \frac{r}{10} = \frac{(H/2)}{(H)} \Rightarrow \frac{r}{10} = \frac{H}{2H}$$

∴ r = 5 cm

Let V_c be volume of the cone and V_f be the volume of frustum

Volume of cone = (1/3)π(radius)^2(height) cm^3

∴ $V_c = (1/3) \times \pi \times r^2 \times (H/2)$ cm^3

$= (1/3) \times \pi \times 5^2 \times (H/2)$ cm^3

$= (1/3) \times \pi \times 25 \times (H/2)$ cm^3

Volume of frustum = (1/3)πh($R^2 + r^2 + Rr$) cm^3

∴ $V_f = (1/3) \times \pi \times (H/2)(10^2 + 5^2 + 10 \times 5)$ cm^3

$= (1/3) \times \pi \times (H/2) \times 175$ cm^3

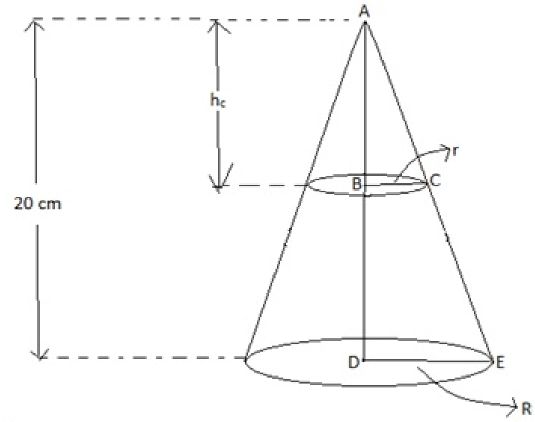
$$\text{Ratio} = \frac{V_c}{V_f} = \frac{(1/3) \times \pi \times 25 \times (H/2)}{(1/3) \times \pi \times (H/2) \times 175} = \frac{1}{7}$$

∴ The ratio of volumes of two parts after cutting = V_c:V_f = 1:7

Question: 18

The height of a r

Solution:



Let the cutting plane be passing through points B and C as shown

Height of cone = AD = H = 20 cm

Height of small cone which we get after cutting = AB = h_c

Let ‘r’ be the radius of small cone ∴ we have BC = r

‘R’ be radius of original cone which is to be cut ∴ we have DE = R

From figure consider ΔABC and ΔADE

$\angle ABC = \angle ADE = 90^\circ$

$\angle BAC = \angle DAE$ ...(common angle)

as two angles are equal by AA criteria we can say that

ΔABC~ΔADE

$\therefore \frac{BC}{DE} = \frac{AB}{AD} \Rightarrow \frac{r}{R} = \frac{h_c}{20}$ ... (i)

Let V_1 be the volume of cone to be cut

Let V_2 be the volume of small cone which we get after cutting

Volume of cone = $(1/3)\pi(\text{radius})^2(\text{height})$ cm^3

$\therefore V_1 = (1/3) \times \pi \times R^2 \times h_c$

$\therefore V_2 = (1/3) \times \pi \times r^2 \times 20$

Given is that the volume of small cone is (1/8) times the original cone

$\therefore V_2 = (1/8)\ V_1$

$\therefore (1/3) \times \pi \times r^2 \times 20 = (1/8) \times (1/3) \times \pi \times R^2 \times h_c$

$\therefore \frac{r^2}{R^2} = \frac{(1/8) \times (1/3) \times \pi \times h_c}{(1/3) \times \pi \times 20}$

Using equation (i) we get

$\therefore \frac{{h_c}^2}{20^2} = \frac{(1/8) \times 20}{h_c}$

$\therefore {h_c}^3 = 20^3/8$ cm

$\therefore h_c = 20/2$ cm

$\therefore h_c = 10$ cm

But we have to find the height from base i.e. we have to find BD from figure

$\therefore 20 = BD + h_c$

$\therefore 20 = BD + 10$

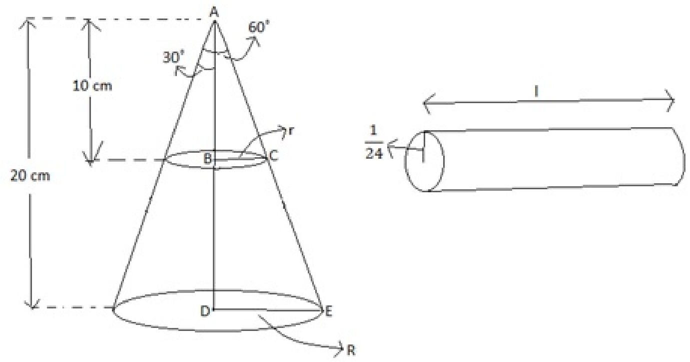
$\therefore BD = 10$ cm

$\therefore$ 10 cm above base the section is made.

Question: 19

A solid metallic

Solution:



Let ‘R’ be the radius of the base of the cone which is also the base of frustum i.e. lower circular end as shown in the figure

DE = R

Let ‘r’ be the radius of the upper circular end of frustum which we get after cutting the cone

BC = r

The height of the cone is 20 cm and we had cut the cone at midpoint therefore height of the frustum so obtained is 10 cm

Vertical angle as shown in the figure is 60°

Now a wire of diameter 1/12 (i.e. radius 1/24) is made out of the frustum let ‘l’ be the length of the wire

As we are using the full frustum to make wire therefore volumes of both the frustum and the wire must be equal.

$\therefore$ Volume of frustum = volume of wire made ...(i)

Consider ΔABC

$\angle BAC = 30^\circ$; AB = 10 cm ; BC = r

we have $\tan 30 = \dfrac{BC}{AB} \Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{r}{10}$

$\therefore r = 10/\sqrt{3}$ cm

Consider ΔADE

$\angle DAE = 30^\circ$; AD = 20 cm ; DE = R

we have $\tan 30 = \dfrac{DE}{AD} \Rightarrow \dfrac{1}{\sqrt{3}} = \dfrac{R}{20}$

$\therefore R = 20/\sqrt{3}$ cm

Now using equation (i)

$$\therefore \frac{1}{3} \times \pi \times h \times (R^2 + r^2 + Rr) = \pi \times \left(\frac{1}{24}\right)^2 \times l$$

$$\therefore \frac{1}{3} \times 10 \times \left[\left(\frac{20}{\sqrt{3}}\right)^2 + \left(\frac{10}{\sqrt{3}}\right)^2 + \left(\frac{20}{\sqrt{3}} \times \frac{10}{\sqrt{3}}\right)\right] = \frac{1}{576} \times l$$

$$\therefore \frac{10}{9} \times (400 + 100 + 200) = \frac{l}{576}$$

∴ 7000/9 = l/576

∴ 777.778 = l/576

∴ l = 448000 cm

Length of wire = 448000 cm

Question: 20

A fez, the cap us

Solution:

Given: Radius of lower circular end = R = 10 cm

Radius of upper circular end = r = 4 cm

Slant height = l = 15cm

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l$ cm^2

As the lower circular end is open we need to subtract the area of lower circular end from total surface area since we don't require material for lower circular end it should be open so that it is wearable.

∴ Total surface area = $\pi r^2 + \pi R^2 + \pi(R + r)l - \pi R^2$ cm^2

= $(22/7) \times (4^2 + (10 + 4) \times 15)$ cm^2

= $(22/7) \times (16 + 210)$ cm^2

= $22 \times 226/7$ cm^2

= 710.285 cm^2

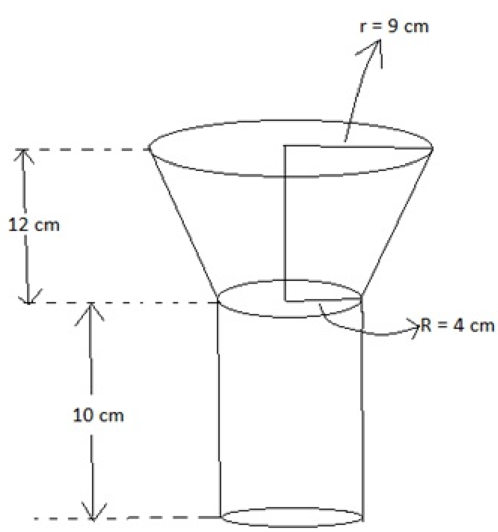
∴ total surface area = 710.285 cm^2

∴ Area of material used = 710.285 cm^2

Question: 21

An oil funnel mad

Solution:



Divide the funnel into two parts frustum and cylinder as shown in the figure

Parameters of frustum:

Diameter of upper circular end = 18 cm

∴ Radius of upper circular end = r = 18/2 = 9 cm

The radius of cylinder is equal to the radius of lower circular end of frustum

∴ radius of lower circular end = R = 4 cm

Height of frustum = total height – height of cylinder

= 22 – 10

= 12 cm

∴ height of frustum = h = 12 cm

Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l$ cm^2

Where l = slant height

For slant height we have $l = \sqrt{(R - r)^2 + h^2}$ cm

$\therefore\ l = \sqrt{(4 - 9)^2 + 12^2} = \sqrt{25 + 144} = 13$ cm

∴ l = 13 cm

Since for the frustum part of the funnel we don’t require the upper circular end and the lower circular end hence we need to subtract those areas from total surface area.

Area of upper circular end = πr^2

Area of lower circular end = πR^2

total surface area = $\pi r^2 + \pi R^2 + \pi(R + r)l - \pi r^2 - \pi R^2$

= $\pi(R + r)l$

= 3.14 × (9 + 4) × 13

= 530.66 cm^2

∴ total surface area of frustum for which tin is required = 530.66 cm^2

Parameters of cylinder:

Height of cylinder = 10 cm

Radius of cylinder = 4 cm

∴ Area of tin require to make cylinder = 2π × (radius) × (height)

= 2 × 3.14 × 4 × 10

= 251.2 cm^2

∴ Area of tin required to make the funnel = area of frustum for which tin is required + area

of tin require to make cylinder

∴ area of tin required to make funnel = 530.66 + 251.2

= 781.86 cm^2

∴ Area of tin sheet require to make the funnel = 781.86 cm^2

Exercise : 19D

Question: 1

A river 1.5 m dee

Solution:

Given,

Depth of the river = 1.5 m

Width of the river = 36 m

Flow rate of river = 3.5 km/hr

Now first change the rate of flow of the water in meter/min

As we know,

1 km = 1000 m

1 hour = 60 minutes

So,

$$3.5 \text{ km/r} = \frac{3.5 \text{ km}}{1 \text{ hour}}$$

$$= \frac{3.5 \times 1000 \text{ m}}{1 \times 60 \text{ min}}$$

$$= \frac{350}{6} \text{ m/min}$$

River travel in a minute = 350/6 m

Now,

The amount of water that runs into sea per minute;

350/6 × 1.5 × 36 = 350 × 1.5 × 6 = 3150

So,

The amount of water that runs into the sea per minute is 3150 m^3

Question: 2

The volume of a c

Solution:

Given,

Volume of the cube = 729 cm^3

Let the edge of the cube = a cm

So,

Volume (v) of the cube = $a^3 a^3 = 729 a^3 = (9cm)^3 a = 9$ cm

Lateral surface area of cube = $4a^2 = 4 \times 92 = 4 \times 81 = 324 cm^2$Total surface area of the cube = $6a^2 = 6 \times 9^2 = 6 \times 81 = 486\ cm^2$

Question: 3

How many cubes of

Solution:

Given,

Edge of the Cubical Box = 1 m

Volume of the Cubical Box = a^3

Edge of the cubes = 10 cm

Volume of the cube = a^3

Number of Cubes = Volume of box/volume of the cube= 100 × 100 × 100/10 × 10 × 10=

1000000/1000= 1000 cubes

Question: 4

Three cubes of ir

Solution:

Given,

Edge of the first cube = 6 cm

Volume of the first cube = $a^3 = (6)^3$ cm

Edge of the second cube = 8 cm

Volume of the second cube = $a^3 = (8)^3$ cm

Edge of the third cube = 10 cm

Volume of the third cube = $a^3 = (10)^3$ cm

So,

Volume of the formed cube = Volume of the First + Second + Third Cube

Volume of the formed cube = v1 + v2 + v3= $6^3 + 8^3 + 10^3$= 216 + 512 + 1000= 1728Now volume of new cube = a^3= 1728Edge of new cube = a = $\sqrt[3]{1728}$a = 12Therefore surface area of new cube = $6a^2 = 6 \times 12^2 = 6 \times 12 \times 12 = 864$ cm^2

Question: 5

Five identical cu

Solution:

Given,

Edge of the given Cube = 5 cm

Now,

Length (l) of the resulting cuboid = Edge × Number of cubes

= 5 x 5 = 25 cm

Breadth (b) of the resulting cuboid = 5 cm

Height (h) of the resulting cuboid = 5 cm

So,

Volume of the resulting cuboid = l × b × h

= 25 x 5 x 5

= 625 cm^3

Hence,

The volume of the resulting cube is 625 cm^3

Question: 6

The volumes of tw

Solution:

Given,

Ratio of two cube = 8:27

Let the edges of the cubes to x and y

As,

$$\Rightarrow \frac{\text{Volume of the first cube}}{\text{Volume of the second cube}} = \frac{8}{27}$$

$$\Rightarrow \frac{x^3}{y^3} = \frac{8}{27}$$

$$\frac{x}{y} = \sqrt[3]{\frac{8}{27}}$$

$\frac{x}{y} = \frac{2}{3}$ ....(i)

Now,

The ratio of the surface areas of the cubes = $\frac{\text{Surface area of the first cube}}{\text{Surface area of the second cube}}$

$\Rightarrow 6x^2/6y^2$

$= (x/y)^2$

$= (2/3)^2$ .... [Using (i)]

= 4/9

= 4 : 9

So,

The ratio of the surface areas of the given cubes is 4 : 9.

Question: 7

The volume

Solution:

Given,

Radius of the right circular cylinder = 176/7 cm^3

Height of the right circular cylinder = Radius of the right circular cylinder

So,

$\Rightarrow h = r$

As,

Volume of the right circular Cylinder = 176/7 cm^3

$\Rightarrow \pi r^2 h = 176/7$

$\Rightarrow 22/7 \times h^2 \times h = 176/7$

$\Rightarrow h^3 = 176 \times 7/7 \times 22$

$\Rightarrow h^3 = 8$

$\Rightarrow h = 3\sqrt{8}$

Therefore,

h = 2 cm

So,

The height of the right circular cylinder is 2 cm

Question: 8

The ratio between

Solution:

Given,

Ratio of the base and the height of a cylinder is 2:3

So,

Let the radius of the base = r

And

The height of the cylinder = h

r : h = 2 : 3

That is,

r/h = 2/3

So,

h = 3r/2 – – – – – – – – – – (i)

As,

Volume of the cylinder = 12936 cm^3

⇒ $\pi r^2 h=12936$

⇒ $22/7 \times r^2 \times 3r/2=12936$ [Using (i)]

⇒ $33/7 \times r^3=12936$

⇒ $r^3 = 12936 \times 7/33$

⇒ $r^3 = 2744$

⇒ r = 3√2744

Therefore,

r = 14 cm

So,

The radius of the base of the cylinder is 14 cm.

Question: 9

The radii of two

Solution:

Let the radus of the first cylinder = r_1

And the radus of the second cylinder = r_2;

Let the height of first cylinder = h_1

And the height of second cylinder = h_2

Given,

$r_1 : r_2 = 2 : 3$

r_1/r_2 = 23 ………………… (i)

And

$h_1 : h_2 = 5 : 3$

$h_1/h_2 = 5/3$ ……… (ii)

Now,

The ratio of the volumes of the cylinders = $\frac{\text{Volume of first cylinder}}{\text{Volume of second cylinder}}$

$= \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$

$= \left(\frac{r_1}{r_2}\right)^2 \times \frac{h_1}{h_2}$

$= \left(\frac{2}{3}\right)^2 \times \frac{5}{3}$ .... [Using (i) and (ii)]

= 20/27

= 20 : 27

So,

The ratio of the volumes of the given cylinders is 20 : 27

Question: 10

66 cubic cm of si

Solution:

Given,

Volume of the wire = 66 cm^3

Diameter of the wire = 1 mm

Radius (r) of wire = 12 = 0.5 mm = 0.05 cm

Let the length of the wire be l

As,

Volume of the wire = 66 cm^3

⇒ $\pi r^2 l$ = 66

⇒ 227 × 0.05 × 0.05 × l = 66

⇒ l = 66 × 722 × 0.05 × 0.05

Therefore,

l = 8400 cm = 84 m

So,

The length of the wire is 84 m.

Question: 11

If the area of th

Solution:

Given,

Area of the base of the right circular cone = 3850 cm^2

Height of the right circular cone = 84 cm

Let the radius of the cone = r

And the slant height of the cone = l

As,

Area of the base of the cone = 3850 cm^2

⇒ πr^2 = 3850

$\Rightarrow 227 \times r^2 = 3850$

$\Rightarrow r^2 = 3850 \times 722$

$\Rightarrow r^2 = 1225$

$\Rightarrow r = \sqrt{1225}$

Therefore,

r = 35 cm

Now,

length = $\sqrt{h^2 + r^2}$

$= \sqrt{(84)^2 + (35)^2}$

$= \sqrt{7056 + 1225}$

$= \sqrt{8281}$

= 91 cm

So,

The slant height of the given cone is 91 cm.

Question: 12

A cylinder with b

Solution:

Given,

Base radius (r) of the cylinder = 8 cm

Height (h) of the cylinder = 2 cm and

Height (H) of the cone = 6 cm

Let the base radius of the cone = R

Now,

As the cylinder is melted to form the cone,

So,

Volume of the cone = Volume of the cylinder

$\Rightarrow 1/3\pi R^2 H = \pi r^2 h$

$\Rightarrow R^2 = 3r^2 hH$

$\Rightarrow R2=3 \times 8 \times 8 \times 26$

$\Rightarrow R^2 = 64$

$\Rightarrow R = \sqrt{64}$

Therefore,

R = 8 cm

So,

The radius of the base of the cone is 8 cm.

Question: 13

a right cylindric

Solution:

Let suppose the radius of the cone = r

And height of the cone = h,

Then,

Radius of the cylindrical vessel = r and

Height of the cylindrical vessel = h

Now,

The required number of cones = Volume of the cylindrical vessel/Volume of a cone

$= \pi r^2 h/(1/3\pi r^2 h)$

= 3

So,

The number of the cones that is required to store the water is 3.

Question: 14

The volume of a s

Solution:

The volume of the sphere = 4851 cm^3

Let the radius of the sphere = r

As,

Volume of the sphere = 4851 cm^3

$\Rightarrow 4/3\pi r^3 = 4851$

$$\Rightarrow \frac{4}{3} \times \frac{22}{7} \times r^3 = 4851$$

$$\Rightarrow r^3 = 4851 \times \frac{3 \times 7}{4 \times 22}$$

$\Rightarrow r^3 = 92618$

$\Rightarrow r = 3\sqrt{92618}$

$\Rightarrow$ r = 212cm

Now,

The Curved surface area of the sphere = $4\pi r^2$

= 4 × 22/7 × 21/2 × 21/2

= 1386 cm^2

So,

The curved surface area of the sphere is 1386 cm^2

Question: 15

The curved surfac

Solution:

Given,

Curved surface area of the sphere = 5544 cm^3

Let the radius of the sphere = r

As we know,

Curved surface area of the sphere = $4\pi r^2$

So,

$\Rightarrow 4\pi r^2 = 5544$

$\Rightarrow 4 \times \frac{22}{7} \times r^2 = 5544$

$\Rightarrow r^2 = 5544 \times \frac{7}{4 \times 22}$

$\Rightarrow r^2 = 441$

$\Rightarrow r = \sqrt{441}$

$\Rightarrow r = 21$ cm

Now,

Volume of the sphere = $4/3\pi r^3$

$= 4/3 \times 22/7 \times 21 \times 21 \times 21$

$= 38808\ cm^3$

So,

The volume of the sphere is $38808\ cm^3$.

Question: 16

The surface areas

Solution:

Let suppose the radius of first spheres = r

And the radius of second spheres = R

As per the question,

Surface area of the first sphere /Surface area of the second sphere = 4/25

$\Rightarrow 4\pi r^2/4\pi R^2 = 4/25$

$\Rightarrow (r/R)^2 = 4/25$

$\Rightarrow r/R = \sqrt{4/25}$

$\Rightarrow r/R = 2/5$ …………………(i)

Now,

The ratio of the volumes of the two sphere = $\frac{\text{Volume of the first sphere}}{\text{Volume of the second sphere}}$

$= \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi R^3}$

$= (r/R)^3$

$= (2/5)^3$ …………………[Using (i)]

$= 8/125$

$= 8 : 125$

So,

The ratio of the volumes of the given spheres will be 8 : 125

Question: 17

A solid metallic

Solution:

Given,

Radius (R) of the solid metallic sphere = 8 cm

Radius (r) of the spherical ball = 2 cm

Now,

The number of spherical balls obtained = $\frac{\text{Volume of the solid metallic sphere}}{\text{Volume of the a spherical ball}}$

$= \frac{\frac{4}{3}\pi r^3}{\frac{4}{3}\pi R^3}$

$= (R/r)^3$

$= (8/2)^3$

$= 4^3$

= 64

So,

The number of spherical balls obtained is 64.

Question: 18

How many lead sho

Solution:

Given,

Diameter of the lead shot = 3 mm

Radius (r) of a lead shot = 3/2 = 1.5 mm = 0.15 cm and

Dimensions of the cuboid = 9 cm x 11 cm x 12 cm

Now,

The number of the lead shots = $\frac{\text{Volume of the cuboid}}{\text{Volume of a shot}}$

$= \frac{9 \times 12 \times 12}{\frac{4}{3}\pi r^3}$

$= \frac{9 \times 12 \times 12}{\frac{4}{3} \times \frac{22}{7} \times 0.15 \times 0.15 \times 0.15}$

= 84000

So,

84000 number of lead shots can be made from the cuboid.

Question: 19

A metallic cone o

Solution:

Cone:

Radius = 12cm

Height = 24 cm.

Sphere, radius = 2cm

Volume of cone is given as, $V = \frac{1}{3} \times \pi \times r^2 \times h$

$\Rightarrow V = \frac{1}{3} \times \frac{22}{7} \times 12^2 \times 24$

$\Rightarrow V = 3620\ cm^3$

Volume of sphere , $V = \frac{4}{3} \times \pi \times r^3$

$\Rightarrow V = \frac{4}{3} \times \pi \times 2^3$

$\Rightarrow V = 33.52\ cm^3$

∴ the number of squares formed will be: 3620/34 = 106

Question: 20

A hemisphere of l

Solution:

Given,

Radius (R) of the hemisphere = 6 cm

Height (h) of the cone = 75 cm

Let the radius of the base of the cone = r

Now,

Volume of the cone = Volume of the hemisphere

$\Rightarrow \frac{1}{3}\pi r^2 h = \frac{2}{3}\pi r^3$

$\Rightarrow r^2 = \frac{2R^3}{h}$

$\Rightarrow r^2 = \frac{2 \times 6 \times 6 \times 6}{75}$

$\Rightarrow r^2 = 5.76$

$\Rightarrow r = \sqrt{5.76}$

Therefore,

r = 2.4 cm

So,

The radius of the base of the cone is 2.4 cm.

Question: 21

A copper sphere o

Solution:

<u>The basic concept required to solve any such question is that the volume of the two figures will be same, so here we will equate the volume of sphere to that of wire which is in shape of a cylinder and subsequently will find out the height of the cylinder.</u>

Given diameter of copper sphere = D = 18 cm

∴ Radius of the sphere = R = d/2=18/2 = 9 cm

As we know the wire is cylindrical in shape so,

Let the height of the cylindrical wire be ‘h’ cm

Given diameter of cylindrical wire = d = 4 mm

⇒ Radius of the cylindrical wire = r = d/2= 4/2= 2 mm= 0.2 cm (∵ 1 mm = 0.1 cm)

Volume of a sphere= $\frac{4}{3}\pi R^3$ (where R=radius of sphere)→eqn1

= $\frac{4}{3}\pi(9^3)$ (putting value of R in eqn 1)

= $\frac{4}{3} \times \pi \times 729$

⇒ Volume of sphere = 4π × 243= 972π cm^3→eqn2

Volume of cylinder = $\pi r^2 h$

Where r = radius of base of cylinder and h = height of cylinder

⇒ Volume of cylindrical wire = π × $(0.2)^2$ × h (putting value of r)

= 0.04π × h cm^3→eqn3

Now on equating equation 2 and equation 3, we get,

Volume of sphere = Volume of cylindrical wire

⇒ 972π = 0.04πh

⇒ π(927) = π(0.04h) (taking π common on both sides)

⇒ 927 = 0.04h

⇒ $\frac{972}{0.04} = h$

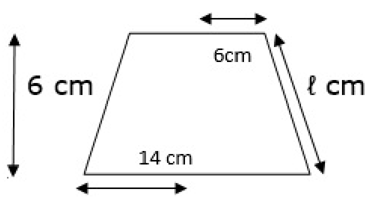
∴ h = 24300 cm

The height of cylindrical wire is 24300 cm or 243 m.

Question: 22

The radii o

Solution:



Given height of frustum = h =6 cm

Radius of top = r = 6 cm

Radius of bottom = R = 14 cm

Let the slant height of the frustum be ‘ ℓ ’ cm

We know in frustum

$(\text{Slant height})^2 = (\text{height})^2 + (R - r)^2$→eqn1

⇒ $\ell^2 = 6^2 + (14 - 6)^2$ (putting values of r, R and h in eqn1)

⇒ $\ell^2 = 36 + 8^2$

⇒ $\ell^2 = 36 + 64$

⇒ $\ell^2 = 100$

⇒ $\ell = \sqrt{100}$

$\therefore$ ℓ = 10 cm

Slant height of the frustum is 10 cm.

Question: 23

Find the ra

Solution:

Let the radius of the sphere be 'R' units

And the cube which will fit inside it be of edge 'a' units

Explanation: The longest diagonal of the cube that will fit inside the sphere will be the diameter of the of the sphere.

$\therefore$ The longest diagonal of cube = the diameter of the sphere

Consider ΔBCD, $\angle BDC = 90°$

BD = CD = a units (as they are the edges of cube)

$BC^2 = CD^2 + BD^2$ (Pythagoras theorem)

$\Rightarrow BC^2 = a^2 + a^2$ (putting value of BD and CD)

$\Rightarrow BC^2 = 2a^2$

$\Rightarrow BC = \sqrt{(2a^2)}$

$\therefore$ BC = $a\sqrt{2}$ units →eqn1

Now consider ΔABC, $\angle ABC = 90°$

Here, AB = a units and BC = $a\sqrt{2}$ units

$AC^2 = AB^2 + BC^2$ (Pythagoras theorem)

$\Rightarrow AC^2 = a^2 + (a\sqrt{2})^2$ (putting values of AB and BC)

$\Rightarrow AC^2 = a^2 + 2a^2$

$\Rightarrow AC^2 = 3a^2$

$\Rightarrow AC = \sqrt{(3a^2)}$

$\therefore$ AC = $a\sqrt{3}$ units

$\therefore$ Diameter of sphere = D = $a\sqrt{3}$ units

And we know, D = 2 × R

$\Rightarrow$ R = D/2 (put value of D)

$$\therefore R = \frac{a\sqrt{3}}{2} \text{ units}$$

Also, Volume of a sphere= $\frac{4}{3}\pi R^3$→eqn2

Put value of R in eqn2

$$= \frac{4}{3}\pi\left(\frac{a\sqrt{3}}{2}\right)^2$$

$$= \frac{4 \times \pi \times 3a^2}{3 \times 4}$$

$\therefore$ Volume of sphere = πa^2 cubic units → eqn3

Volume of cube = $(edge)^3$

∴ Volume of cube = a^3 cubic units →eqn4

Ratio of volume of cube to that of sphere= $\frac{\text{Volume of cube}}{\text{Volume of sphere}}$

$= \frac{a^3}{\pi(a)^2}$ (putting values from eqn3 and eqn4)

⇒Ratio of volume of cube to that of sphere= $\frac{a^3}{\pi \times a^2}$

$= \frac{a}{\pi}$

Ratio of volume of cube to that of sphere is a:π

Question: 24

Find the ra

Solution:

Let the radius of cylinder, cone and sphere be ‘r’ cm

Let the diameter of cylinder, sphere and cone be ‘2r’ units

∴ Height of cylinder, cone, sphere = h = 2r units

Volume of cylinder = $\pi(r^2)h$

⇒ Volume of cylinder = $\pi \times r^2 \times 2r$ (putting value of h)

∴ Volume of cylinder = $2\pi \times r^3$→eqn1

Volume of sphere= $\frac{4}{3}\pi(r)^3$

$= \frac{4\pi \times r^3}{3} \rightarrow$ eqn2

Volume of cone= $\frac{1}{3}\pi(r)^2h$ (put the value of h)

⇒Volume of cone= $\frac{\pi \times r^2 \times 2r}{3}$

∴ Volume of cone= $\frac{2\pi \times r^3}{3} \rightarrow$ eqn3

Ratio of volume of cylinder to that of a cone to that of a sphere as:

⇒ Volume of cylinder : Volume of Cone : Volume of sphere

$\Rightarrow 2\pi \times r^3 : \frac{2\pi \times r^3}{3} : \frac{4\pi \times r^3}{3}$

$\Rightarrow 2 : \frac{2}{3} : \frac{4}{3}$ (dividing the above relation by (πr^3)

$\Rightarrow 1 : \frac{1}{3} : \frac{2}{3}$ (dividing the above ratio by 2)

⇒3 : 1 : 2 (multiplying the above ratio by 3)

Ratio of volume of cylinder to that of cone to that of sphere is 3 : 1 : 2

Question: 25

Two cubes e

Solution:

Given volume of each cube = 125 cm^3

Let the edge of each cube be ‘a’ cm

So, Volume of cube = a^3

$\Rightarrow a^3 = 125$

$\Rightarrow a = \sqrt[3]{(125)}$

$\therefore$ a = 5 cm →eqn1

Now when we join the two cubes then resulting cuboid will be of length twice that of the cube and breadth and height of the resulting cuboid will be same as that of the cube

⇒ length of cuboid = L = 2 × a

⇒ L = 2 × 5 (putting value of a from eqn1)

∴ L = 10 cm

Now, Breadth of cuboid = B = a

⇒ B = 5 cm

Similarly, height of the cuboid = H = 5 cm

Note: Where ever in a question Surface Area is mentioned, it means Total surface area.

Surface area = Total surface area = 2(LB + BH + HL)

⇒ S.A = 2((10 × 5) + (5 × 5) + (10 × 5))

⇒ S.A = 2(50 + 25 + 50)

⇒ S.A = 2 × 125

∴ S.A = 250 cm^2

Surface Area of resulting cuboid is 250 cm^2.

Question: 26

Three metal

Solution:

Let the edges of cubes be a_1, a_2 and a_3

So, a_1 = 3 cm, a_2 = 4 cm, and a_3 = 5 cm

Explanation: Here the sum of volumes of all three cubes will be equal to the volume of the resulting larger cube as the resulting cube is formed by melting the three cubes.

Volume of cube with edge $a_1 = v_1 = (a_1)^3$

$\Rightarrow v_1 = (3)^3$

$\therefore v_1 = 27\ cm^3$→eqn1

Similarly

Volume of cube with edge $a_2 = v_2 = (a_2)^3$

$\Rightarrow v_2 = (4)^3$

$\therefore v_2 = 64\ cm^3$→eqn2

Volume of cube with edge $a_3 = v_3 = (a_3)^3$

$\Rightarrow v_3 = (5)^3$

$\therefore v_3 = 125\ cm^3$→eqn3

Now let the volume of resulting cube be ‘V’ cm^3

So, $V = v_1 + v_2 + v_3$

⇒ V = 27 + 64 + 125 (from eqn1, eqn2 and eqn3)

∴ V = 216 cm^3→eqn4

Let the edge of resulting cube be ‘a’ cm

So, volume of the resulting cube = V = a^3→eqn5

Equate equation 4 and 5,

⇒ $a^3 = 216$

⇒ $a = \sqrt[3]{216}$

∴ a = 6 cm

The edge of new cube formed is 6 cm.

Question: 27

A solid met

Solution:

Let the diameter of sphere be ‘D’ and Radius of sphere be ‘R’

∴ D = 8 m

Also, we know

R = D/2

⇒ R = 8/2

∴ R = 4 m

Explanation: Here the volume of sphere will be equal to the volume of the resulting cylinder as the resulting cylinder is formed by melting the sphere.

Volume of the sphere, $V_1 = \frac{4}{3}\pi R^3$ (put the value of R)

$= \frac{4}{3}\pi(4^3)$

$= \frac{4\pi \times 64}{3}$

$= \frac{256\pi}{3}$ m^3 → eqn1

Let the length/height of the cylinder be ‘H’ and let the radius of the cylinder be ‘r’ and volume of the cylinder be ‘V_2’

∴ H = 12 m

Volume of the cylinder = $V_2 = \pi(r^2)H$

⇒ $V_2 = \pi(r^2) \times 12$ (putting value of H)

⇒ $V_2 = 12\pi \times r^2$ m^3→eqn2

Now equate equation 1 and 2,

⇒ $V_2 = V_1$

⇒ $12\pi \times r^2 = \frac{256\pi}{3}$

⇒ $r^2 = \frac{256\pi}{3 \times 12\pi}$

⇒ $r^2 = \frac{256}{36}$

$\Rightarrow r^2 = \frac{64}{9}$

$\Rightarrow r \sqrt{\frac{64}{9}}$

$\Rightarrow r = \frac{8}{3}$

$\therefore$ r = 2.66 m

Width of cylinder = diameter of cylinder = 2 × radius

⇒ Width of cylinder = 2 × r

⇒ Width of cylinder = 2 × 2.66

$\therefore$ Width of cylinder = 5.32 m

Width of the resulting cylinder is 5.32 m

Question: 28

A 5-m-wide cloth

Solution:

Let the length of the cloth used be 'L' cm

Area of cloth used = 5 × L →eqn1

Also, Given Diameter = d = 14 m and height = h = 24 m

$\therefore$ Radius = r = D/2

⇒ r = 14/2

$\therefore$ r = 7 m

Let the slant height of the cone be ℓ m

So, $(\text{Slant height})^2 = (\text{Height})^2 + (\text{Radius})^2$

Put the values in the above relation

$\Rightarrow \ell^2 = h^2 + r^2$

$\Rightarrow \ell^2 = 24^2 + 7^2$

$\Rightarrow \ell^2 = 576 + 49$

$\Rightarrow \ell^2 = 625$

$\Rightarrow \ell = \sqrt{(625)}$

$\therefore \ell = 25$ cm →eqn1

Also, we know Curved Surface Area of cone = $\pi r \ell$

Where r = radius of base, ℓ = slant height

C.S.A = π × 7 × 25

$\Rightarrow \text{C.S.A} = \frac{22}{7} \times 7 \times 25 \left(\pi = \frac{22}{7}\right)$

⇒ C.S.A = 22 × 25

⇒ C.S.A = 550 m^2→eqn2

Now the Curved surface area of conical tent will be equal to the area of the cloth used to make the tent

⇒ C.S.A = Area of cloth

⇒ 550 = 5 × L (from eqn1 and eqn2)

$\Rightarrow L = \frac{550}{5}$

∴ L = 110 m

So, cost of the cloth used = rate of cloth × Length of the cloth

⇒ Cost of cloth used = 25 × 110

⇒ Cost of cloth = Rs.2750

Cost of the cloth used is Rs. 2750

Question: 29

A wooden toy was

Solution:

Given height of cylinder = h = 10 cm

Radius of cylinder = r = 3.5 cm

Radius of hemisphere = R = 3.5 cm

Explanation: In this question the volume of wood in toy can be calculated by subtracting the volume of two hemisphere from the volume of cylinder.

So, volume of cylinder = $\pi r^2 h$

Where r = radius of cylinder and h = height of cylinder

⇒ Volume of cylinder = $\pi \times (3.5)^2 \times 10$ (from given values)

⇒ Volume of cylinder = π × 12.25 × 10

∴ Volume of cylinder = 122.5π cm^3→eqn1

Volume of a hemisphere= $\frac{2}{3}\pi R^3$ (where R is radius of hemisphere)

$= \frac{2}{3} \times \pi \times (3.5)^3$

$= \frac{2\pi \times 42.875}{3}$

$= \frac{85.75\pi}{3}\ cm^3$

$= 2 \times \frac{85.75\pi}{3}$

∴ Volume of two hemisphere= $\frac{171.5\pi}{3}\ cm^3 \rightarrow$ eqn2

Volume of wood in toy = eqn1 – eqn2

⇒Volume of wood in toy= $122.5\pi - \frac{171.5\pi}{3}$

$= \left(122.5 - \frac{171.5}{3}\right)\pi$ (taking π common)

$= \left(\frac{367.5 - 171.5}{3}\right)\pi$

$= \left(\frac{196}{3}\right)\pi \left(\text{put } \pi = \frac{22}{7}\right)$

$= \frac{196}{3} \times \frac{22}{7}$

$= \frac{28 \times 22}{3}$

∴ Volume of wood in toy = 205.333 cm^3

<u>Volume of wood in toy is 205.333 cm^3.</u>

Question: 30

Three cubes of a

Solution:

Let the edges of metal cubes be a_1, a_2 and a_3

And it is given that ratio of edges is 3:4:5

So, let $a_1 = 3x$, $a_2 = 4x$ and $a_3 = 5x$

Volume of cube with edge $a_1 = v_1 = (a_1)^3$

$\Rightarrow v_1 = (3x)^3$

$\therefore v_1 = 27x^3 \text{ cm}^3 \rightarrow$ eqn1

Similarly

Volume of cube with edge $a_2 = v_2 = (a_2)^3$

$\Rightarrow v_2 = (4x)^3$

$\therefore v_2 = 64x^3 \text{ cm}^3 \rightarrow$ eqn2

Volume of cube with edge $a_3 = v_3 = (a_3)^3$

$\Rightarrow v_3 = (5x)^3$

$\therefore v_3 = 125x^3 \text{ cm}^3 \rightarrow$ eqn3

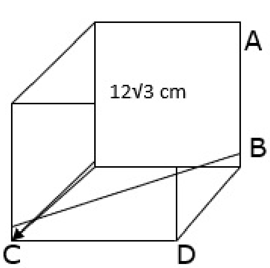
Now let the volume of resulting cube be 'V' cm^3

So, $V = v_1 + v_2 + v_3$

$\Rightarrow V = 27x^3 + 64x^3 + 125x^3$ (from eqn1, eqn2 and eqn3)

$\therefore V = 216x^3 \text{ cm}^3 \rightarrow$ eqn4

It is given that the diagonal of the resulting cube is $12\sqrt{3}$ cm



Let the edge of resulting cube be 'a' cm

Consider ΔBCD, ∠BDC = 90°

BD = CD = a cm (as they are the edges of cube)

$BC^2 = CD^2 + BD^2$ (Pythagoras theorem)

$\Rightarrow BC^2 = a^2 + a^2$ (putting value of BD and CD)

$\Rightarrow BC^2 = 2a^2$

$\Rightarrow BC = \sqrt{(2a^2)}$

$\therefore BC = a\sqrt{2}$ cm

Now consider ΔABC, $\angle ABC = 90°$

Here, AB = a cm and BC = $a\sqrt{2}$ cm and AC = $12\sqrt{3}$ cm

$AC^2 = AB^2 + BC^2$ (Pythagoras theorem)

$\Rightarrow (12\sqrt{3})^2 = a^2 + (a\sqrt{2})^2$ (putting values of AB, AC and BC)

$\Rightarrow 144 \times 3 = a^2 + 2a^2$

$\Rightarrow 144 \times 3 = 3a^2$

$\Rightarrow 144 = a^2$

$\Rightarrow a = \sqrt{144}$

$\therefore a = 12$ cm

So, volume of the resulting cube = $V = a^3$

$\Rightarrow V = 12^3$ (putting value of a)

$\therefore V = 1728\ cm^3$ –eqn5

Equate equation 4 and 5

$\Rightarrow 216x^3 = 1728$

$\Rightarrow x^3 = 1728/216$

$\Rightarrow x^3 = 8$

$\Rightarrow x = \sqrt[3]{8}$

$\therefore x = 2$

So $a_1 = 3x = 3 \times 2$

$\Rightarrow a_1 = 6$ cm

Similarly $a_2 = 4x = 4 \times 2$

$\therefore a_2 = 8$ cm

Similarly $a_3 = 5x = 5 \times 2$

$\therefore a_3 = 10$ cm

<u>The edges of three cubes are 6 cm, 8 cm and 10 cm.</u>

Question: 31

A hollow sp

Solution:

External diameter of hollow sphere = D = 8 cm

$\Rightarrow$ External radius of hollow sphere = R = D/2

$\Rightarrow R = 8/2$

$\Rightarrow R = 4$ cm

Internal diameter of hollow sphere = d = 4 cm

$\Rightarrow$ Internal radius of hollow sphere = r = d/2

$\Rightarrow r = 4/2$

$\Rightarrow$ r = 2 cm

Let the height of the resulting cone be 'h' cm

Let the volume of External sphere be V_1 and that of internal be V_2.

Explanation: Here the volume of hollow sphere will be equal to the volume of the resulting cone as the resulting cone is formed by melting the sphere.

Volume of the External sphere= $V_1 = \frac{4}{3}\pi R^3$ (put the value of R)

$$= \frac{4}{3}\pi(4^3)$$

$$= \frac{4\pi \times 64}{3}$$

$$= \frac{256\pi}{3}\ cm^3 \rightarrow eqn1$$

Volume of the Internal sphere = $V_2 = \frac{4}{3}\pi r^3$ (put the value of r)

$$= \frac{4}{3}\pi(2^3)$$

$$= \frac{4\pi \times 8}{3}$$

$\therefore$ Volume of the Internal sphere = $V_2 = \frac{32\pi}{3}\ cm^3 \rightarrow eqn2$

Volume of sphere = V = External volume – Internal volume

$$\Rightarrow V = \frac{256\pi}{3} - \frac{32\pi}{3}$$

$$\Rightarrow V = \frac{(256 - 32)\pi}{3}$$

$$\Rightarrow V = \frac{224\pi}{3}\ cm^3 \rightarrow eqn3$$

Given base radius of the resulting cone = r' = 8 cm

Le the height be 'h' and volume of the resulting cone be V'

$$\Rightarrow V' = \frac{1}{3}\pi(r')^2 h$$

$\Rightarrow V' = \frac{1}{3}\pi(8^2)h$ (putting value of r')

$$\Rightarrow V' = \frac{64\pi h}{3}\ cm^3 \rightarrow eqn4$$

Equate equation 3 and 4,

$\Rightarrow$ V = V'

$$\Rightarrow \frac{224\pi}{3} = \frac{64\pi h}{3}$$

$\Rightarrow$ 224 = 64h

$\Rightarrow$ h = 224/64

$\therefore$ h = 3.5 cm

The height of resulting cone is 3.5 cm.

Question: 32

A bucket of

Solution:

Upper end radius of frustum = d/2= 28/2 = 14 cm

Lower end radius of frustum = D/2 = 42/2 =21 cm

Height of the frustum = 24 cm

And we know,

The amount of milk that bucket can hold = Volume of the bucket

And, Volume of bucket = Volume of Frustum

∴ Amount of milk that bucket can hold = Volume of frustum

⇒Volume of frustum= $\frac{1}{3} \times \pi \times h \times (r^2 + R^2 + (r \times R))$

Where R = Radius of larger or lower end and r = Radius of smaller or upper end and h = height of frustum π = 22/7

⇒Volume of frustum= $\frac{1}{3} \times \frac{22}{7} \times 24 \times \left(14^2 + 21^2 + (14 \times 21)\right)$

$= \frac{22}{7} \times 8 \times (196 + 441 + 294)$

$= \frac{22}{7} \times 8 \times 931$

= 22 × 8 × 133

∴ Volume of frustum = 23408 cm^3

Also we know that 1 litre = 1000 cm^3

⇒ Volume of frustum in litre = 23408/1000= 23.408 litre

⇒ Amount of milk that the bucket hold = 23.408 litre

⇒ The cost of milk = Rate of milk × amount of milk bucket holds

⇒ The cost of milk = 30 × 23.408

∴ = Rs. 702.24

The cost of milk is Rs.702.24

Question: 33

The interio

Solution:

Explanation: Here in order to find th outer surface area of building we need to simply add the curved surface areas of cone and cylinder.

Given height of cylinder = h = 4 m

Height of cone = h’ = 2.8 m

Diameter of cylinder = diameter of cone = d = 4.2 m

⇒ Radius of cone = Radius of cylinder = d/2 =4.2m/2 = 2.1 m

Outer surface area of building = C.S.A of cylinder + C.S.A of cone

Now, C.S.A of cylinder = 2πrh →eqn1

Where r = radius of base of cylinder, h = height of cylinder

And C.S.A of cone = πr ℓ →eqn2

Where r = radius of base of cone, ℓ = Slant height of cone

We know in a cone

$(\text{Slant height})^2 = (\text{height})^2 + (\text{radius})^2$ (put the given values)

$(\ell)^2 = (2.8)^2 + (2.1)^2$

$\Rightarrow (\ell)^2 = 7.84 + 4.41$

$\Rightarrow (\ell)^2 = 12.25$

$\Rightarrow \ell = \sqrt{(12.25)}$

$\therefore \ell = 3.5$ m

Now, C.S.A of cone = $\pi \times 2.1 \times 3.5$ (putting the values in eqn2)

$\Rightarrow$ C.S.A of cone = $7.35\pi\ m^2 \rightarrow$eqn3

C.S.A of cylinder = $2 \times \pi \times 2.1 \times 4$ (putting the values in eqn1)

$\Rightarrow$ C.S.A of cylinder = $2 \times \pi \times 4.41 \times 4$

$\therefore$ C.S.A of cylinder = $16.8\pi\ m^2 \rightarrow$eqn4

Outer surface area of building = eqn3 + eqn4

$\Rightarrow$ Outer surface area = $7.35\pi + 16.8\pi$

$= 24.15\pi$

$\therefore$ Outer surface area $= 75.9\ m^2$

<u>The outer surface area of building is 75.9 m^2.</u>

Question: 34

A metallic

Solution:

Let the Radius of cone be ‘r’ and height of cone be ‘h’

$\therefore$ r = 21 cm and h = 84 cm

<u>Explanation: Here the volume of cone will be equal to the volume of the resulting sphere as the resulting sphere is formed by melting the cone.</u>

Volume of cone, $V_1 = \frac{1}{3}\pi(r^2)h$

$$\Rightarrow V_1 = \frac{1}{3} \times \pi \times (21)^2 \times 84$$

$\Rightarrow V_1 = \pi \times 441 \times 28$

$\therefore V_1 = 12348\pi\ m^3 \rightarrow$eqn1

Let the Radius of resulting sphere be ‘R’ cm

Volume of the sphere= $V_1 = \frac{4}{3}\pi(R)^3 \rightarrow$ eqn2 (put the value of R)

Now equate equation 1 and 2,

$\Rightarrow V_2 = V_1$

$$\Rightarrow \frac{4}{3}\pi(R)^3 = 12348\pi$$

$$\Rightarrow \frac{4 \times R^3}{3} = 12348$$

$$\Rightarrow R^3 = \frac{12348 \times 3}{4}$$

$\Rightarrow R^3 = 3087 \times 3$

$\Rightarrow R^3 = 9261$

$\Rightarrow R = \sqrt[3]{(9261)}$

$\therefore R = 21$ cm

Diameter of Sphere = 2 × radius

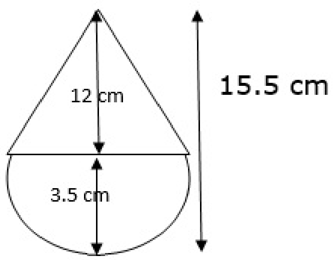
$\Rightarrow$ Diameter of Sphere = 2 × R = 42 m

Diameter of the resulting Sphere is 42 m

Question: 35

A toy is in the f

Solution:



Explanation: The total surface area of the toy can be calculated by taking the sum of the Curved surface area of cone and that of hemisphere of same radius.

Given total height of toy = H = 15.5 cm

Radius of hemisphere = Radius of cone = r = 3.5 cm

Now the height of cone = h = total height – radius of hemisphere

$\Rightarrow$ Height of cone = h = 15.5 – 3.5

$\therefore$ Height of cone = h = 12 cm

Let the slant height of the cone be ‘ ℓ ’ cm

Also we know that in a cone,

$(\text{Slant height})^2 = (\text{Height})^2 + (\text{Radius})^2$

$\Rightarrow \ell^2 = 12^2 + 3.5^2$ (putting the values)

$\Rightarrow \ell^2 = 144 + 12.25$

$\Rightarrow \ell^2 = 156.25$

$\Rightarrow \ell = \sqrt{(156.25)}$

$\therefore \ell = 12.5$ cm

C.S.A of cone = $\pi r \ell$

$\Rightarrow$ C.S.A of cone = $\pi \times 3.5 \times 12.5$ (putting the given values)

$\therefore$ C.S.A of cone = 43.75π m^2 →eqn1

C.S.A of hemisphere = $2\pi r^2$

$\Rightarrow$ C.S.A of hemisphere = $2 \times \pi \times 3.5^2$

$= 2 \times \pi \times 12.25$

$= 24.5\pi$ m^2 →eqn2

Now total surface area of toy = eqn1 + eqn2

⇒ Total surface area of toy = 43.75π + 24.5π

= 68.25π

⇒The total surface area of toy= $68.25 \times \frac{22}{7}$ (putting π= 22/7)

= 9.75 × 22

= 214.5 m^2

The total surface area of the toy is 214.5 m^2.

Question: 36

If the radii of t

Solution:

Explanation: Here the bucket is in the shape of a frustum. So capacity of bucket will be equal to the volume of the frustum and in order to calculate the total surface area of the bucket we will subtract the top end circular area from the total surface area of the frustum as the bucket is open on top.

Upper end radius of frustum/bucket = R = 28 cm

Lower end radius of frustum/bucket =r = 7 cm

Height of the frustum/bucket = 28 cm

And we know,

The capacity of bucket = Volume of the bucket

And, Volume of bucket = Volume of Frustum

∴ Capacity of bucket = Volume of frustum

⇒Volume of frustum= $\frac{1}{3} \times \pi \times h \times (r^2 + R^2 + (r \times R))$

Where R = Radius of larger or upper end and r = Radius of smaller or lower end and h = height of frustum π = 22/7

⇒Volume of frustum= $\frac{1}{3} \times \frac{22}{7} \times 28 \times \left(7^2 + 28^2 + (7 \times 28)\right)$

$= \frac{22}{3} \times 4 \times (49 + 784 + 196)$

$= \frac{22}{3} \times 4 \times 1029$

= 22 × 4 × 343

∴ Volume of frustum = 30184 cm^3

∴ Capacity of bucket = 30184 cm^3

T.S.A of bucket = T.S.A of frustum – Area of upper circle →eqn1

Let the slant height of the frustum be ‘ ℓ ’ cm

So, $\ell^2 = h^2 + (R - r)^2$

⇒ $\ell^2 = 28^2 + (28 - 7)^2$

⇒ $\ell^2 = 784 + (21)^2$

⇒ $\ell^2 = 784 + 441$

⇒ $\ell^2 = 1225$

⇒ $\ell = \sqrt{(1225)}$

∴ $\ell = 35$ cm

⇒ T.S.A of frustum = $\pi(R + r)\ell + \pi R^2 + \pi r^2$

= $\pi(28 + 7) \times 35 + \pi(28)^2 + \pi(7)^2$

= $35 \times 35\pi + 784\pi + 49\pi$

= $1225\pi + 784\pi + 49\pi$ →eqn2

Area of upper circle = πR^2

= $\pi(28)^2$

= 784π →eqn3

T.S.A of bucket = $1225\pi + 784\pi + 49\pi - 784\pi$ (from eqn2 and 3)

⇒ T.S.A of bucket = 1274π

⇒T.S.A of bucket=$1274 \times \frac{22}{7}\left(\text{putting } \pi = \frac{22}{7}\right)$

⇒ T.S.A of bucket = 182×22

∴ T.S.A of bucket = 4004 cm^2

The capacity and total surface area of the bucket is 30184 cm^3 and 4004 cm^2.

Question: 37

A bucket is in th

Solution:

Upper end radius of frustum/bucket = R = 20 cm

Lower end radius of frustum/bucket =r = 12 cm

Height of the frustum/bucket be 'h' cm

And we know,

The capacity of bucket = Volume of the bucket

And, Volume of bucket = Volume of Frustum

Volume of frustum/bucket = V = 12308.8 cm^3

∴ Capacity of bucket = Volume of frustum

⇒Volume of frustum= $V = \frac{1}{3} \times \pi \times h \times (r^2 + R^2 + (r \times R))$

Where R = Radius of larger or upper end and r = Radius of smaller or lower end and h = height of frustum π = 3.14

$$\Rightarrow \frac{1}{3} \times \pi \times h \times (r^2 + R^2 + (r \times R)) = V$$

⇒ $\frac{1}{3} \times 3.14 \times h \times \left(12^2 + 20^2 + (12 \times 20)\right) = 12308.8$ (putting the values)

⇒ $3.14 \times h \times (144 + 400 + 240) = 12308.8 \times 3$

⇒ $3.14 \times h \times 784 = 36926.4$

⇒ $2461.76 \times h = 36926.4$

⇒ $h = 36926.4/2461.76$

∴ h = 15 cm

The height of the bucket is 15 cm.

Question: 38

A milk container

Solution:

Upper end radius of container = R = 20 cm

Lower end radius of container =r = 8 cm

Height of the container be ‘h’ cm

As container is in shape of frustum

Volume of container = Volume of Frustum

$V = 10459\frac{3}{7}\ cm^3$

$\Rightarrow V = \frac{73216}{7}\ cm^3$

$\Rightarrow$ Volume of frustum $= V = \frac{1}{3} \times \pi \times h \times (r^2 + R^2 + (r \times R))$

Where R = Radius of larger or upper end and r = Radius of smaller or lower end and h = height of frustum π = 22/7

$\Rightarrow \frac{1}{3} \times \pi \times h \times (r^2 + R^2 + (r \times R)) = V$

$\Rightarrow \frac{1}{3} \times \frac{22}{7} \times h \times \left(8^2 + 20^2 + (8 \times 20)\right) = \frac{73216}{7}$ (putting the values)

$\Rightarrow \frac{22}{3} \times h \times (64 + 400 + 160) = 73216$

$\Rightarrow \frac{22}{3} \times h \times 624 = 73216$

$\Rightarrow 22 \times h \times 208 = 73216$

$\Rightarrow 4576 \times h = 73216$

$\Rightarrow h = 73216/4576$

$\therefore h = 16$ cm

Let the slant height of the frustum be ‘ ℓ ’ cm

So, $\ell^2 = h^2 + (R - r)^2$

$\Rightarrow \ell^2 = 16^2 + (20 - 8)^2$

$\Rightarrow \ell^2 = 256 + (12)^2$

$\Rightarrow \ell^2 = 256 + 144$

$\Rightarrow \ell^2 = 400$

$\Rightarrow \ell = \sqrt{(400)}$

$\therefore \ell = 20$ cm

Now the Area of sheet used in making the container can be calculated by simply subtracting the area of the upper circular end from the T.S.A of frustum

$\Rightarrow$ T.S.A of frustum $= \pi(R + r)\ell + \pi R^2 + \pi r^2$

$= \pi(20 + 8) \times 20 + \pi(20)^2 + \pi(8)^2$

$= 28 \times 20\pi + 400\pi + 64\pi$

$= 560\pi + 464\pi$

$= 1024\pi$ →eqn1

Area of upper circular end $= \pi R^2$

$= \pi(20)^2$

$= 400\pi \rightarrow$eqn2

T.S.A of container = 1024π – 400π (from eqn2 and 1)

⇒ T.S.A of container = 624π

$= \frac{13728}{7}\ \text{cm}^2$

⇒ Cost of metal sheet used = T.S.A of container × Rate per cm^2

⇒ Cost of mtal sheet used= $\frac{13728}{7} \times 1.40$

= 13728 × 0.2

= Rs. 2745.6

The cost of the metal sheet used is Rs. 2745.6

Question: 39

A solid metallic

Solution:

Explanation: Here the volume of all the resulting cones will be exactly equal to the volume of the sphere from which they are formed. Son we would find the volume of sphere and then divide the volume of sphere with the volume of one cone to find the number of cones formed.

Diameter of the sphere = D = 28 cm

Radius of the sphere = 28/2

Radius of the sphere = R = 14 cm Volume of the sphere= $V_1 = \frac{4}{3}\pi R^3$ (put the value of R)

⇒Volume of the sphere = $V_1 = \frac{4}{3}\pi(14^3)$

$= \frac{4\pi \times 2744}{3}$

$= \frac{10976\pi}{3}\ \text{m}^3 \rightarrow \text{eqn1}$

Let the number of cones formed out of the sphere be 'x'

Diameter of each cone= $4\frac{2}{3}\ \text{cm} = \frac{14}{3}\ \text{cm}$

Given the height of each cone = h = 3 cm

Then, radius

$r = \frac{\frac{14}{3}}{2}$

$r = \frac{14}{3 \times 2}$

$r = \frac{7}{3}\ \text{cm}$

Volume of one cone $= V_2 = \frac{1}{3}\pi(r^2)h$

$\Rightarrow V_2 = \frac{1}{3} \times \pi \times \left(\frac{7}{3}\right)^2 \times 3$

$\Rightarrow V_2 = \frac{49\pi}{9}\ \text{cm}^3 \rightarrow \text{eqn2}$

Volume of ‘n’ number of cones = n × volume of one cone

Volumes of ‘m’ number of cones = volume of sphere

$$m \times \frac{49\pi}{9} = \frac{10976\pi}{3}$$

$$\Rightarrow m \times \frac{49}{3} = 10976$$

$$\Rightarrow m = \frac{10976 \times 3}{49}$$

$\Rightarrow m = 224 \times 3$

$\therefore m = 672$

The number of cones formed out of the sphere is 672

Question: 40

A cylindrical ves

Solution:

Given internal diameter of cylinder = D = 10 cm

Internal radius of cylinder = R = D/2 = 10/2

Internal radius of cylinder = R = 5 cm

Height of cylinder = H = 10.5 cm

Diameter of solid cone = d = 7 cm

Radius of solid cone = r = d/2 = 7/2

Radius of solid cone = r = 3.5 cm

Height of cone = h = 6 cm

(i)Volume displaced out of cylinder

By Archimedes principle we can easily say that,

Volume displaced out of cylinder = Volume of the solid cone

$$\text{Volume of cone} = V_2 = \frac{1}{3}\pi(r^2)h$$

$$\Rightarrow V_2 = \frac{1}{3} \times \pi \times (3.5)^2 \times 6$$

$$\Rightarrow V_2 = \frac{22}{7} \times 12.25 \times 2$$

$\Rightarrow V = 22 \times 1.75 \times 2$

$\therefore V = 77\ cm^3$

The volume displaced out of cylinder is 77 cm^3.

(ii)Volume left in cylinder

Volume left in cylinder = Volume of cylinder – Volume displaced out

Volume of cylinder = $\pi(R)^2H$

⇒ Volume of cylinder = $\pi \times (5)^2 \times 10.5$ (putting the given values)

⇒ Volume of cylinder = $\pi \times 25 \times 10.5$

⇒ Volume of cylinder = $\pi \times 262.5$

$\Rightarrow$ Volume of cylinder = $\frac{22}{7} \times 262.5$

$\Rightarrow$ Volume of cylinder = 22 × 37.5

∴ Volume of cylinder = 825 cm^3→eqn1

Volume left in cylinder = 825 – 77 (from eqn1 and (i))

∴ Volume left in cylinder = 748 cm^3

The volume left in the cylinder is 748 cm^3.

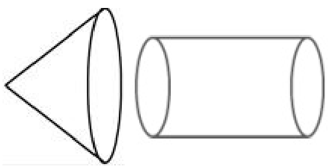
Exercise : MULTIPLE CHOICE QUESTIONS (MCQ)

Question: 1

A cylindrical pen

Solution:

Pencil is a combination of Cylinder + Cone

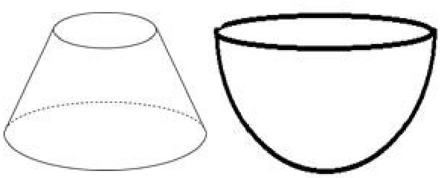


Question: 2

A shuttlecock use

Solution:

Shuttle is a combination of Frustum of a cone + Hemisphere

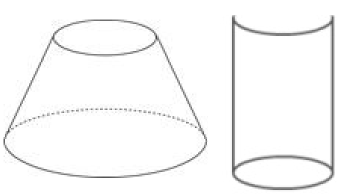


Question: 3

A funnel is the c

Solution:

Funnel is a combination of Frustum of a cone + Cylinder

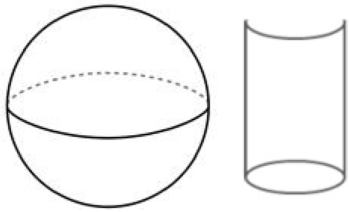


Question: 4

A Sarahi is a com

Solution:

Sarahi is a combination of Sphere + Cylinder

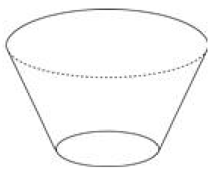


Question: 5

The shape of a gl

Solution:

Glass is in the shape of a Frustum of a cone.

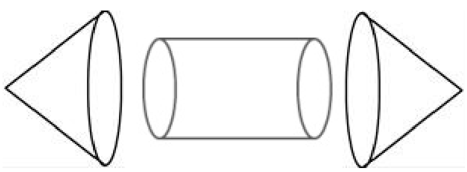


Question: 6

The shape of a Gi

Solution:

Gilli in the gili-Danda is a combination of Frustum of a frustum of a cone + Cylinder + cone



Question: 7

A plumbline (sahu

Solution:

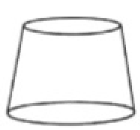
Plumbline (sahul) is a combination of a Cone + hemisphere.

Question: 8

A cone is cut by

Solution:

When a cone is cut by a plane parallel to its base and the upper part is removed. The part that is left over is called frustum of a cone.



Question: 9

During conversion

Solution:

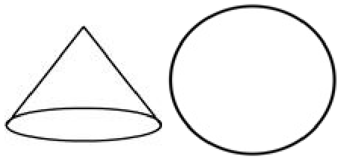
When a object of certain volume is melted and converted to some other shape, the volume of the new object formed will be the same as the volume of the old object.

Question: 10

In a right circul

Solution:

In a right circular cone, the cross section made by a plane parallel to the base is a cicle.



Question: 11

A solid piece of

Solution:

Given: Dimension of cuboid (49 cm × 33 cm × 24 cm)

Volume of cuboid is : length × breadth × height

Volume of Solid Sphere is : $\frac{4}{3} \times \pi \times r^3$ (here r is radius of the sphere)

Let v_1 be the volume of given cuboid.

$\therefore v_1 = 49 \text{ cm} \times 33 \text{ cm} \times 24 \text{ cm} = 38808 \text{ cm}^3$

Let v_2 be the volume of Solid Sphere.

We know that when a object is moulded from one shape to other its volume does not change.

$\therefore v_1 = v_2$

That is,

$38808 = \frac{4}{3} \times \pi \times r^3$

$r^3 = \frac{3}{4\pi} \times 38808$

$r^3 = 9261$ $r = \sqrt[3]{9261} = 21$

$\therefore r = 21\text{cm}$

That is, radius of the Solid sphere = 21cm

Question: 12

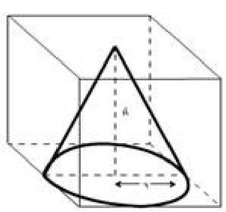
The radius (in cm

Solution:

Given: edge of the cube = 4.2 cm

A right circular cone is a Cone whose height is perpendicular to the diameter (radius) of the base circle.

In a cube, a largest right circular Cone is formed when its base lies on one of the faces of the Cube and its tip lies on the opposite face.



$\therefore$ Diameter of largest right circular Cone in Cube = edge length of cube.

$\therefore$ Diameter = 4.2 cm

$\Rightarrow$ Radius $= \frac{\text{diameter}}{2} = \frac{4.2}{2} = 2.1$ cm

$\therefore$ Radius of the largest right circular Cone in Cube is 2.1 cm

Question: 13

A metallic solid

Solution:

Given: Radius of the solid sphere = 9 cm

Radius of the cylinder = 9 cm

Volume of Solid Sphere is: $\frac{4}{3} \times \pi \times r^3$ (here r is radius of the sphere)

Volume of Solid Cylinder is: $\pi \times r^2 \times h$ (here r is radius and h is height of the cylinder)

Let v_1 be the volume of given Solid Sphere.

$\therefore v_1 = \frac{4}{3} \times \pi \times 9^3$ cm^3

Let v_2 be the volume of Solid Cylinder.

$\therefore v_2 = \pi \times 9^2 \times h$

We know that when a object is moulded from one shape to other its volume does not change.

$\therefore v_1 = v_2$

That is,

$\frac{4}{3} \times \pi \times 9^3 = \pi \times 9^2 \times h$

$h = \frac{\frac{4}{3} \times \pi \times 9 \times 9 \times 9}{\pi \times 9 \times 9} = \frac{4}{3} \times 9 = 12$ cm

$\therefore$ h = 12 cm

That is Height of the Cylinder is 12 cm

Question: 14

A rectangular she

Solution:

Given: Dimensions of rectangular sheet: 40cm × 22cm

Height of the Hollow Cylinder : 40cm

Area of the Rectangle is = length × breadth

Curved surface Area of the Cylinder = $2\pi rh$ (where r and h are radius and height of cylinder respectively)

Let a_1 be the area of Rectangle

$\therefore a_1 = 40 \times 22$ cm^2

Let a_2 be the Curved surface area of Cylinder

$\therefore a_2 = 2 \times \pi \times r \times 40$ cm^2

We know that when area of a surface doesn’t change even if its shape is changed.

$\therefore a_1 = a_2$

$\Rightarrow 40 \times 22 = 2 \times \pi \times r \times 40$

$\Rightarrow r = \frac{40 \times 22}{2 \times \pi \times 40} = \frac{11}{\pi} = \frac{11 \times 7}{22} = \frac{7}{2} = 3.5$ cm

$\therefore$ Radius of the Cylinder is 3.5cm

Question: 15

The number of sol

Solution:

Given: Diameter of the Solid Sphere is: 6 cm

Height of the Cylinder is: 45cm

Diameter of the Cylinder is: 4cm

Volume of Solid Cylinder is: $\pi \times r^2 \times h$ (here r is radius and h is height)

Volume of the Solid Sphere is: $\frac{4}{3} \times \pi \times r^3$ (here r is the radius of the Sphere)

Let v_1 be the volume of given Cylinder

$\therefore v_1 = \pi \times 2^2 \times 45\ cm^3$ (4cm is diameter, $\therefore$ 2cm is the radius of cylinder)

Let v_2 be the volume of Solid Sphere.

$V_2 = \frac{4}{3} \times \pi \times 3^3\ cm^3$ (6cm is the diameter, $\therefore$ 3cm is the radius of the Sphere)

We know that when a object is moulded from one shape to other its volume does not change.

Let n be the number of Solid Sphere of diameter 6cm required.

$\therefore v_1 = n \times v_2$ (volume of n Spheres = volume of Cylinder)

That is,

$\pi \times 2^2 \times 45 = n \times \frac{4}{3} \times \pi \times 3^3$

$n = \frac{\pi \times 2 \times 2 \times 45}{\frac{4}{3} \times \pi \times 3 \times 3 \times 3} = \frac{2 \times 2 \times 45 \times 3}{4 \times 3 \times 3 \times 3} = \frac{45}{9} = 5$

That is 5 Solid Spheres of diameter 6 cm can be formed by the Solid Cylinder of height 45 cm and diameter 4 cm.

Question: 16

The surface areas

Solution:

Given: Surface area ratio of two Spheres is: 16:9

Volume of the Sphere is: $\frac{4}{3} \times \pi \times r^3$ (where r is radius of sphere)

Surface area of the sphere is: $4 \times \pi \times r^2$ (where r is radius of sphere)

Let S_1 and S_2 be two different spheres.

(Surface area of) S_1: (Surface area of) S_2 = 16:9

$4 \times \pi \times (r_1)^2 : 4 \times \pi \times (r_2)^2 = 16:9$ (here r_1 and r_2 are the radii of S_1 and S_2 respectively)

$(r_1)^2 : (r_2)^2 = 16:9$

$r_1 : r_2 = \sqrt{16} : \sqrt{9}$

$r_1 : r_2 = 4:3$

Now,

Let V_1 and V_2 be the volumes of the spheres S_1 and S_2 respectively.

$\therefore V_1 : V_2 = \frac{4}{3} \times \pi \times (r_1)^3 : \frac{4}{3} \times \pi \times (r_2)^3$ (here r_1 and r_2 are the radii of S_1 and S_2 respectively)

$\Rightarrow V_1 : V_2 = (r_1)^3 : (r_2)^3$

$\Rightarrow V_1 : V_2 = (4)^3 : (3)^3$

$\Rightarrow V_1:V_2 = 64:27$

∴ The ratios of the volumes is: 64:27

Question: 17

If the surface ar

Solution:

Given: surface area of a sphere is 616 cm^2

Surface area of the sphere is: $4 \times \pi \times r^2$ (where r is radius of sphere)

∴ $4 \times \pi \times r^2 = 616\ cm^2$

$r^2 = \frac{616}{4 \times \pi} = \frac{154}{\pi} = 49$

$r = \sqrt{49} = 7$ cm

∴ Diameter = 2 × r = 2 × 7 = 14cm

Question: 18

If the radius of

Solution:

Let r_1 be the initial radius of the sphere.

∴ $r_1 = r$

Let r_2 be the radius after increasing it 3 times the size of initial radius.

∴ $r_2 = 3r$

Let V_1 be the initial volume of the sphere

∴ $V_1 = \frac{4}{3} \times \pi \times (r_1)^3 = \frac{4}{3} \times \pi \times r^3$

Let V_2 be the volume of the sphere after its radius is increased by 3 times.

∴ $V_2 = \frac{4}{3} \times \pi \times (r_2)^3 = \frac{4}{3} \times \pi \times (3r)^3$

$\Rightarrow V_2 = 27 \times \frac{4}{3} \times \pi \times r^3$

∴ If radius is increased by 3 times, its volume will be increased by 27 times.

Question: 19

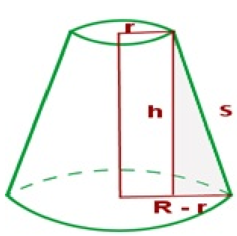
If the height of

Solution:

Given: Height of the frustum of a cone: 16 cm

Diameters of the Circular ends: 40cm and 16 cm.

Radius of the Circular ends: $\frac{40}{2} = 20$cm and $\frac{16}{2} = 8$cm



Here slant height h can be found by using Pythagoras theorem.

∴ $s^2 = h^2 + (R\text{-}r)^2$ (here R is 20cm and r is 8cm)

$\Rightarrow s^2 = 16^2 + (20—8)^2$

$\Rightarrow s^2 = 16^2 + (12)^2$

$\Rightarrow s^2 = 256 + 144$

$\Rightarrow s^2 = 400$

$\Rightarrow s = \sqrt{400} = 20$

∴ Slant height 0f the Frustum is 20cm

Question: 20

A sphere of diame

Solution:

Given: Diameter of a sphere: 18cm ⇒ radius = $\frac{18}{2}$ = 9cm

Diameter of Cylindrical vessel: 36cm ⇒ radius = $\frac{36}{2}$ = 18cm

It is given that Sphere is dropped into the cylindrical vessel containing some water.

∴ Volume of sphere = Volume of water in Cylinder displaced (raised)

Let V_1 be the volume of the Sphere

$\therefore V_1 = \frac{4}{3} \times \pi \times (r_1)^3$

$V_1 = \frac{4}{3} \times \pi \times 9^3$

Let V_2 be the volume of the water displaced in the cylindrical vessel

$\therefore V_2 = \pi \times (r_2)^2 \times h$ (here r_2 is the radius of the Cylinder and h is the level of water raised in the vessel after dropping the sphere into the cylindrical vessel)

$V_2 = \pi \times 18^2 \times h$

Since $V_1=V_2$

$\frac{4}{3} \times \pi \times 9^3 = \pi \times 18^2 \times h$

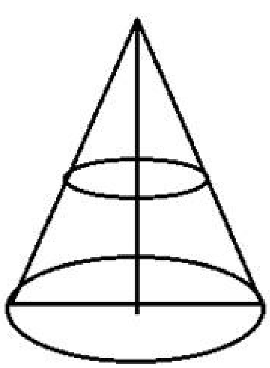
$h = \frac{\frac{4}{3} \times \pi \times 9 \times 9 \times 9}{\pi \times 18 \times 18} = \frac{4 \times 9 \times 9 \times 9}{3 \times 18 \times 18} = 3\text{cm}$

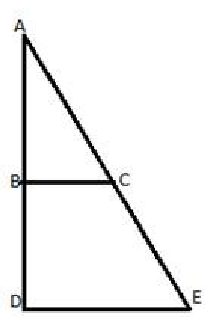
∴ The water level rises by 3cm when the dropped sphere is completely submerged in the cylindrical vessel.

Question: 21

A solid right cir

Solution:





Given: A solid right circular cone is cut into two parts at the middle of its height by a plane parallel to its base

Let 'H' be the height of the cone.

Let 'R' be the Radius of the complete cone.

Volume of a cone is given by: $\frac{1}{3}\pi r^2 h$

Here,

$AB = BD = \frac{H}{2}$

Let r be the radius of the smaller cone.

∴ In ΔABC and ΔADE

∠ABC = ADE (90°)

∠CAB = ∠EAB (common)

∴ ΔABC ~ ΔADE (AA similarity criterion)

$\Rightarrow \frac{OA}{OC} = \frac{AB}{CD}$ (Corresponding sides are proportional)

$\Rightarrow \frac{H}{\frac{H}{2}} = \frac{R}{r}$

$\Rightarrow R = 2r$

Volume of smaller cone $= \frac{1}{3}\pi(r)^2 \times h = \frac{1}{3}\pi(BC)^2 \times AB = \frac{1}{3}\pi(r)^2 \times \frac{H}{2} = \frac{\pi \times r \times H}{6}$ cm^3

Volume of whole cone $= \frac{1}{3}\pi(r)^2 \times h = \frac{1}{3}\pi(DE)^2 \times AD = \frac{1}{3}\pi(2r)^2 \times H = \frac{4}{3}\pi r^2 H$ cm^3

$\therefore \frac{\text{Volume of smaller cone}}{\text{Volume of whole cone}} = \frac{\frac{\pi \times r \times H}{6}}{\frac{4}{3}\pi \times r \times r \times H} = \frac{1}{8}$

∴ The ratio of the volume of the smaller cone to the whole cone is 1:8

Question: 22

The radii of the

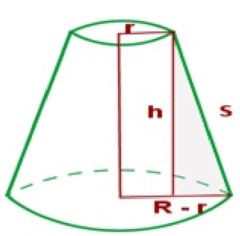
Solution:

Bucket is in the shape of a frustum of a cone

Therefore,

Given: Height of the frustum: 40 cm

Radius of the Circular ends: 24cm and 15cm



Here slant height h can be found by using Pythagoras theorem.

$\therefore s^2 = h^2 + (R\text{-}r)^2$ (here R is 20cm and r is 8cm)

$\Rightarrow s^2 = 40^2 + (24—15)^2$

$\Rightarrow s^2 = 40^2 + (9)^2$

$\Rightarrow s^2 = 1600 + 81$

$\Rightarrow s^2 = 1681$

$\Rightarrow s = \sqrt{1681} = 41$

∴ Slant height 0f the Frustum is 41cm

Question: 23

A solid is hemisp

Solution:

Given: Bottom of a solid is hemispherical and conical above it, both have same radius

and same surface areas.

∴ CSA of hemisphere = CSA of Cone

⇒ $2 \times \pi \times r^2 = \pi rl$ (where r is the radius and l is the slant height)

⇒ $\frac{r \times r}{r \times l} = \frac{\pi}{2 \times \pi}$

⇒ $\frac{r}{l} = \frac{1}{2}$

∴ r:l = 1:2

That is ratio of radius and the slant height of the given solid is 1:2.

Question: 24

If the radius of

Solution:

Given: Radius of the base of a right circular cylinder is halved, keeping the height the same.

Let initial Radius of Right Circular Cylinder be ‘r’.

∴ Radius of the Cylinder after its radius is halved is ‘ $\frac{r}{2}$’

Let ‘h’ be the height of the both the cylinders.

Let V_1 be the volume of the initial Cylinder.

Let V_2 be the volume of the Cylinder after the initial Cylinders base radius is halved.

Volume of the Cylinder is given by: $\pi r^2 h$

∴ $V_1:V_2 = \pi(r_1)^2h : \pi(r_2)^2h$

∴ $V_1:V_2 = \pi(r)^2h : \pi(r_{/2})^2h$

⇒ $V_1:V_2 = 1:\frac{1}{4}$

⇒ $V_1:V_2 = 4:1$

Thus, ratio of the volume of the cylinder thus obtained to the volume of original is 4:1.

Question: 25

A cubical ice-cre

Solution:

Given: Cubical ice-cream brick of edge 22.

Ice-cream cone of radius 2 cm and height 7 cm.

Let ‘n’ be the number of students who get ice-cream cones.

Let V_1 be the volume of the Cubical Ice-cream brick.

Volume of Cube is given by: a^3 (where a is the edge length)

∴ $V_1 = a^3 = 22^3$

Let V_2 be the Volume of the Ice-cream Cone.

Volume of Cone is given by: $\frac{1}{3} \times \pi \times r^2 \times h$ (where r is the radius of the base and h is the edge height of the cone)

$\therefore V_2 = \frac{1}{3} \times \pi \times r^2 \times h = \frac{1}{3} \times \pi \times 2^2 \times 7$

Here,

$V_1 = n \times V_2$

$\therefore 22^3 = n \times \frac{1}{3} \times \pi \times 2^2 \times 7$

$n = \frac{22 \times 22 \times 22 \times 3}{\pi \times 2 \times 2 \times 7} = \frac{22 \times 22 \times 22 \times 3 \times 7}{22 \times 2 \times 2 \times 7} = 363$

$\therefore$ 363 Children can get ice cream cones.

Question: 26

A mason construct

Solution:

Given: A wall of dimension (270 cm × 300cm × 350cm).

A wall of dimension (22.5cm × 11.25cm × 8.75cm).

$\frac{1}{8}$ space is covered by the mortar.

Here $\frac{1}{8}$ volume of the wall is covered by mortar, $\therefore 1 - \frac{1}{8} = \frac{7}{8}$ volume of the wall is covered by bricks.

Volume of the cuboid is given by: lbh (here l, b, h are length , breadth, height respectively).

Let V_1 be the volume of the wall.

$\therefore V_1 = l \times b \times h = 270 \times 300 \times 350$

$\Rightarrow V_1 = 270 \times 300 \times 350 = 28350000 \text{ cm}^2$

Let V_2 be the volume of the brick.

$\therefore V_2 = l \times b \times h = 22.5 \times 11.25 \times 8.75$

$\Rightarrow V_2 = 22.5 \times 11.25 \times 8.75 = \frac{70875}{32} \text{ cm}^2$

Let ‘n’ be the number of bricks required to occupy $\frac{7}{8}$ volume of the wall.

$\therefore n \times \frac{70875}{32} = 28350000 \times \frac{7}{8}$

$\Rightarrow n = 28350000 \times \frac{7}{8} \times \frac{32}{70875} = 11200$

$\therefore n = 11200$

That is 11200 bricks required to occupy $\frac{7}{8}$ volume of the wall.

Question: 27

Twelve solid sphe

Solution:

Given: A solid metallic cylinder of base diameter 2 cm and height 16 cm.

Twelve solid sphere of the same size are made by melting a solid metallic cylinder .

Let V_1 be the volume of the cylinder

Volume of the cylinder is given by: $\pi \times r^2 \times h$

$\therefore V_1 = \pi \times 1^2 \times 16$ (diameter is 2cm, $\therefore$ radius is 1cm)

Let V_2 be the volume of the each Sphere.

Volume of the Sphere is given by: $\frac{4}{3} \times \pi \times r^3$ (where r is the radius of the sphere)

$\therefore V_2 = \frac{4}{3} \times \pi \times r^3$

Here,

$V_1 = 12 \times V_2$

$\therefore \pi \times 1^2 \times 16 = 12 \times \frac{4}{3} \times \pi \times r^3$

$\Rightarrow r^3 = \frac{3 \times \pi \times 16}{\pi \times 4 \times 12} = \frac{\pi \times 16}{\pi \times 4 \times 4} = 1\text{cm}$

$\therefore r = \sqrt[3]{1} = 1$ cm

$\therefore$ Diameter of the Sphere is $2 \times r = 2 \times 1 = 2$cm

Question: 28

The diameter of t

Solution:

Given: Diameter of two circular ends of a bucket are 44 cm and 24 cm, and the height of the bucket is 35 cm.

Bucket is in the shape of frustum.

Let V be the Volume of the Bucket(Frustum)

Volume of the frustum is given by: $\frac{\pi}{3} \times h \times (R^2 + r^2 + Rr)$ (here r and R are the radii of smaller and larger circular ends respectively)

$\therefore V = \frac{\pi}{3} \times h \times (R^2 + r^2 + R \times r)$

$\Rightarrow V = \frac{\pi}{3} \times 35 \times (22^2 + 12^2 + 22 \times 12)$ (diameters are 44 and 24 cm, $\therefore$ their radii are 22cm and 12cm respectively)

$\Rightarrow V = \frac{\pi}{3} \times 35 \times (484 + 144 + 264) = \frac{\pi}{3} \times 35 \times (892)$

$\Rightarrow V = \frac{\pi}{3} \times 35 \times (892) = 32706.6\ \text{cm}^3 = 32.7$ litres ($\because 1000\text{cm}^3 = 1$ litre)

$\therefore$ The capacity of the bucket is: 32.7 litres

Question: 29

The slant height

Solution:

Given: slant height of a bucket is 45

Radii of its top and bottom are 28 cm and 7 cm respectively.

Bucket is in the shape of a frustum.

Let A be the CSA of the Frustum

CSA of the frustum is given by: $\pi l(r_1 + r_2)$ (here l is the slant height and r_1 and r_2 are the radii of top and bottom of the bucket(frustum))

$\therefore A = \pi l(r_1 + r_2)$

$\Rightarrow A = \pi \times 45 \times (28 + 7) = \pi \times 45 \times (35) = 4950\ \text{cm}^2$

$\therefore$ A = 4950 cm^2

That is , curved surface area of the bucket is 4950 cm^2

Question: 30

The volumes of tw

Solution:

Given: Volume ratio of two Spheres is: 64:27

Volume of the Sphere is: $\frac{4}{3} \times \pi \times r^3$ (where r is radius of sphere)

Surface area of the sphere is: $4 \times \pi \times r^2$ (where r is radius of sphere)

Let S_1 and S_2 be two different spheres.

(Volume of) S_1: (Volume of) S_2 = 64:27

$\frac{4}{3} \times \pi \times (r_1)^3 : \frac{4}{3} \times \pi \times (r_2)^3 = 64:27$ (here r_1 and r_2 are the radii of S_1 and S_2 respectively)

$(r_1)^3 : (r_2)^3 = 64:27$

$r_1 : r_2 = \sqrt[3]{64} : \sqrt[3]{27}$

$r_1 : r_2 = 4:3$

Now,

Let SA_1 and SA_2 be the surface areas of the spheres S_1 and S_2 respectively.

$\therefore SA_1 : SA_2 = 4 \times \pi \times (r_1)^2 : 4 \times \pi \times (r_2)^2$ (here r_1 and r_2 are the radii of S_1 and S_2 respectively)

$\Rightarrow SA_1 : SA_2 = (r_1)^2 : (r_2)^2$

$\Rightarrow SA_1 : SA_2 = (4)^2 : (3)^2$

$\Rightarrow SA_1 : SA_2 = 16:9$

$\therefore$ The ratio of the Surface area of spheres is: 16:9

Question: 31

A hollow cube of

Solution:

Given: hollow cube of internal edge 22 cm

Spherical marbles of diameter 0.5 cm $\Rightarrow$ radius = $\frac{0.5}{2}$ = 0.25 cm

$\frac{1}{8}$ space of the cube remains unfilled.

Here, $\frac{1}{8}$ space of the cube is unfilled, that is $\frac{7}{8}$ of the cube is filled with marbles of radius 0.25cm.

Volume of the sphere is : $\frac{4}{3} \times \pi \times r^3$ (where ‘r’ is the radius of the cube)

Let V_1 be the volume of the Sphere.

$\therefore V_1 = \frac{4}{3} \times \pi \times (0.25)^3 = \frac{11}{168}$ cm^3

Volume of the Cube : a^3 (where ‘a’ is the edge length of the cube)

Let V_2 be the volume of the cube.

$\therefore V_1 = (22)^3 = 10648$ cm^3

Let ‘n’ be the number of sphere required to fill the $\frac{7}{8}$ space of the cube.

$\therefore$ n × V_1= V_2 × $\frac{7}{8}$

$\Rightarrow$ n × $\frac{11}{168}$ = 10648 × $\frac{7}{8}$

$\Rightarrow$ n × $\frac{11}{168}$ = 9317

$\Rightarrow$ n = 9317 × $\frac{168}{11}$ = 142296

$\therefore$ Number of marbles required to fill $\frac{7}{8}$ of the cube id 142296.

Question: 32

A metallic spheri

Solution:

Given: Metallic spherical shell of internal and external diameter 4 cm and 8 cm respectively

Recast into the form of a cone of base diameter 8 cm.

Volume of spherical shell is : $\frac{4}{3} \times \pi \times [(r_1)^3 — (r_2)^3]$ (here r_1 an r_2 are External and internal radii respectively)

Let v_1 be the volume of given Spherical shell.

$\therefore v_1 = \frac{4}{3} \times \pi \times [(\frac{8}{2})^3 — (\frac{4}{2})^3] = \frac{4}{3} \times \pi \times [(4)^3 — (2)^3] = \frac{4}{3} \times \pi \times [64 — 8] = \frac{4}{3} \times \pi \times 56 \text{ cm}^3$

Volume of the cone is given by : $\frac{1}{3} \times \pi \times r^2 \times h$

Let v_2 be the volume of cone.

$\therefore V_2 = \frac{1}{3} \times \pi \times (\frac{8}{2})^2 \times h = \frac{1}{3} \times \pi \times 16 \times h \text{ cm}^3$

We know that when a object is moulded from one shape to other its volume does not change.

$\therefore v_1=v_2$

That is,

$\frac{4}{3} \times \pi \times 56 = \frac{1}{3} \times \pi \times 16 \times h$

$h = \frac{\frac{4}{3} \times \pi \times 56}{\frac{1}{3} \times \pi \times 16} = \frac{4 \times 56}{16} = 14$

$\therefore$ h = 14cm

That is, height of the cone = 14cm

Question: 33

A medicine capsul

Solution:

Given: A cylinder of diameter 0.5 cm

The length of the entire capsule is 2 cm

Here, Radius of the Cylinder and Hemisphere is $\frac{0.5}{2}$ = 0.25cm

Height of the Cylinder = length of capsule – 2 × (radius of hemisphere) = 2 – 0.5 = 1.5cm

Volume of Cylinder is: $\pi r^2 h$ (here r, h are radius and height of the cylinder respectively)

Volume of hemisphere is: $\frac{4}{3}\pi r^3$ (here r is the radius of the hemisphere)

Let V_1 be the Cylindrical part of the capsule

$\therefore V_1 = \pi r^2 h = \pi \times (0.25)^2 \times (1.5) = 0.09375\pi\ cm^3$

Let V_2 be the Cylindrical part of the capsule

$\therefore V_1 = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(0.25)^3 = \frac{0.0625}{3}\pi\ cm^3$

$\therefore$ Volume of the capsule = $V_1 + 2V_2 = 0.09375\pi + 2 \times \frac{0.0625}{3}\pi = 0.3599 \approx 0.36cm^3$

$\therefore$ Volume of the capsule is $0.36cm^3$

Question: 34

The length of the

Solution:

Given: A room with dimensions (12 m × 9 m × 8 m)

Room is in the shape of a Cuboid.Longest rod that can be placed in a room is nothing but its diagonal.Let length of the rod be 'L'.

Length of diagonal of a Cuboid = $\sqrt{(l^2 + b^2 + h^2)}$

$\therefore L = \sqrt{(l^2 + b^2 + h^2)}$

$L = \sqrt{(12^2 + 9^2 + 8^2)}$ m$\Rightarrow$ L= $\sqrt{(144 + 81 + 64)}$ m$\Rightarrow$ L = $\sqrt{289}$ m$\Rightarrow$ L = 17 m.$\therefore$ The length of the longest rod is 17 m

Question: 35

The length of the

Solution:

Given: Length of the diagonal of a cube is $6\sqrt{3}$ cm.

We know that the Length of a diagonal of a cube is given by: $a\sqrt{3}$ (here 'a' is edge length of cube)

$\therefore a\sqrt{3} = 6\sqrt{3}$

$\Rightarrow a = 6cm$

$\therefore$ Edge length of the cube is 6cm.

Surface area of a cube is given by: $6a^2$ (here 'a' is the edge length)

Let 'S' be the surface area of the given Cube.

$\therefore S = 6a^2$

$\Rightarrow S = 6 \times (6)^2$

$\Rightarrow S = 216\ cm^2$

$\therefore$ Surface area of the given cube is $216\ cm^2$

Question: 36

The volume of a c

Solution:

Given: volume of a cube is $2744\ cm^3$.

We know that the Volume of a cube is given by: a^3 (here 'a' is edge length of cube)

$\therefore a^3 = 2744$

$\Rightarrow a = \sqrt[3]{2744}$

⇒ a =14cm

∴ Edge length of the cube is 14cm.

Surface area of a cube is given by: $6a^2$ (here ‘a’ is the edge length)

Let ‘S’ be the surface area of the given Cube.

∴ $S = 6a^2$

⇒ $S = 6 \times (14)^2$

⇒ $S = 1176\ cm^2$

∴ Surface area of the given cube is $1176\ cm^2$

Question: 37

The total surface

Solution:

Given: The total surface area of a cube is $864\ cm^2$.

We know that the Volume of a cube is given by: $6a^2$ (here ‘a’ is edge length of cube)

∴ $6a^2 = 864$

⇒ $a^2 = \frac{864}{6} = 144$

⇒ $a = \sqrt{144}$

⇒ a =12cm

∴ Edge length of the cube is 12cm.

Volume of a cube is given by: a^3 (here ‘a’ is the edge length)

Let ‘V’ be the Volume of the given Cube.

∴ $V = a^3$

⇒ $V = (12)^3$

⇒ $V = 1728\ cm^3$

∴ Volume of the given cube is $1728\ cm^3$

Question: 38

How many bricks e

Solution:

Given: Bricks each measuring (25 cm × 11.25 cm × 6 cm)

A wall with dimensions (8 m × 6 m × 22.5 cm)

We know that the Brick and wall are in the shape of a Cuboid.

∴ Volume of a Brick and wall is given by: l × b × h (here l,b,h are the length , breadth, height of the wall and brick)

Let V_1 be the volume of the Wall.

∴ $V_1 = l \times b \times h = 800 \times 600 \times 22.5$ (∵ 8 m = 800cm and 6 m = 600cm)

⇒ $V_1 = 10800000\ cm^3$

Let V_2 be the volume of a Brick.

∴ $V_2 = l \times b \times h = 25 \times 11.25 \times 6$

$\Rightarrow V_2 = 1687.5\ cm^3$

Let 'n' be the number of Bricks required to build the Wall.

$\therefore V_1 = n \times V_2$

$10800000 = n \times 1687.5$

$\Rightarrow n = \frac{10800000}{1687.5} = 6400$

$\therefore n = 6400$

That is, 6400 bricks are required to build the wall.

Question: 39

The area of the b

Solution:

Given: The area of the base of a rectangular tank is 6500 cm^2.

Volume of water contained in it is 2.6 m^3.

We know that Rectangular tank is in the shape of a cuboid.

And also area of the base of a cuboid is given by : $l \times b$ (here l and b are length and breadth respectively)

$\therefore l \times b = 6500\ cm^2$ ….1

Volume of a cuboid is given by: $l \times b \times h$ (here l, b, h are length, breadth, height respectively)

$\therefore l \times b \times h = 2.6\ m^3 = 2.6 \times 1000000\ cm^3 = 2600000\ cm^3$ …2

From —1 and —2

$6500 \times h = 2600000$

$h = \frac{2600000}{6500} = 400\ cm = \frac{400}{100}\ m = 4m$

$\therefore h = 4m$

That is, depth of water in the tank is 4m

Question: 40

The volume of a w

Solution:

Given: The volume of a wall is 12.8 m^3.

Height is 5 times the breadth and Length is 8 times the height.

Let breadth = x

$\therefore$ Height = 5x

$\Rightarrow$ Length = $8 \times (5x) = 40x$

Volume of a Cuboid is given by: $l \times b \times h$ (here l, b, h are, length, breadth, height respectively)

$\therefore l \times b \times h = 12.8$

$\Rightarrow x \times 5x \times 40x = 12.8$

$\Rightarrow 200x^3 = 12.8$

$\Rightarrow x^3 = \frac{12.8}{200}\ m^3 = \frac{8}{125}$

$\Rightarrow x = \sqrt[3]{\frac{8}{125}}\ m = \frac{2}{5}\ m = 0.4\ m$

$\therefore$ x = 0.4m = 0.4 × 100 = 40cm

That is Breadth is: 40cm

Question: 41

If the areas of t

Solution:

Given: areas of three adjacent faces of a cuboid are x, y, z respectively.

Let l, b, h be the length , breadth, height of the cuboid respectively.

$\therefore$ l × b = x – 1

b × h = y – 2

h × l = z – 3

Volume of the cuboid is: l × b × h

multiply eq’s –1, –2, –3

That is ,

$l \times b \times b \times h \times l \times h = x \times y \times z\ l^2 \times b^2 \times h^2$

$\Rightarrow l^2 \times b^2 \times h^2 = xyz$

$\Rightarrow (l \times b \times h)^2 = xyz$

$\Rightarrow (V)^2 = xyz$ ($\because$Volume of the cuboid is: l × b × h)

$\Rightarrow V = \sqrt{xyz}$

$\therefore V = \sqrt{xys}$

That is volume of the given Cuboid is : $\sqrt{xyz}$

Question: 42

The sum of length

Solution:

Given: Sum of length, breadth and height of a cuboid is 19 cm.

Length of diagonal is 5 √ 5 cm.

Let l, b, h be the length , breadth, height of the cuboid respectively.

$\therefore$ l + b + h = 19cm – 1

Length of a diagonal in a cuboid is given by : $\sqrt{(l^2 + b^2 + h^2)}$

$\therefore \sqrt{(l^2 + b^2 + h^2)} = 5\sqrt{5}$ cm $\Rightarrow (l^2 + b^2 + h^2) = (5\sqrt{5})^2 = 125\ cm^2$ – 2

Surface area of Cuboid is: 2(lb + bh + hl)

On squaring eq – 1 on both sides

We get

$(l + b + h)^2 = 19^2$

$\Rightarrow l^2 + b^2 + h^2 + 2(lb + bh + hl) = 361\ cm^2$

$\Rightarrow$ 125+ 2(lb + bh + hl) = 361 (from eq – 2)

$\Rightarrow 2(lb + bh + hl) = 361 – 125 = 236\ cm^2$

$\therefore 2(lb + bh + hl) = 236\ cm^2$

That is, Surface area of the given Cuboid is $236cm^2$

Question: 43

If each edge of a

Solution:

Given: Edge of a cube is increased by 50%

Let 'a' be the Edge of the cube

Area of the cube is : $6l^2$ (where 'l' is the edge of a cube)

Let A_1 be the initial surface area of the cube.

$\therefore A_1 = 6a^2$

Now,

50% of the edge is: $a \times \frac{50}{100} = \frac{a}{2}$

$\therefore$ Edge = $a + \frac{a}{2}$ after increasing edge by 50%

That is edge of the cube after increasing it by 50% is $\frac{3a}{2}$

Let A_2 be the surface area of the cube after increasing the edge by 50%

$\therefore A_2 = 6 \times (\frac{3a}{2})^2 = \frac{9}{4} \times 6a^2$

Here increase in area = $A_2 - A_1$

$\Rightarrow$ increase in area = $\frac{9}{4} \times 6a^2 - 6a^2 = \frac{5}{4} \times 6a^2$

Now, increase in percentage is:

Increase in % = $\frac{\frac{5}{4} \times 6a \times a}{6a \times a} \times 100 = \frac{5}{4} \times 100 = 125\%$

$\therefore$ If each edge of a cube is increased by 50%, then the percentage increase in the surface area is 125%

Question: 44

How many bags of

Solution:

Given: cuboidal granary with dimensions (8 m × 6 m × 3 m)

Volume of the bag : 0.64 m^3

Volume of a Cuboid is given by: $l \times b \times h$ (here l, b, h are length, breadth, height of the Cuboid respectively)

Let 'V' be the Volume of the Cuboidal granary.

$\therefore V = l \times b \times h = 8 \times 6 \times 3 = 144$

Let 'n' be the number of bags that can fit in cuboidal granary.

$\therefore n \times 0.64 = 144$

$\Rightarrow n = \frac{144}{0.64} = 225$

$\therefore n = 225$

That is a total of 225 bags, each of volume 0.64 m^3 can fit in Cuboidal granary.

Question: 45

A cube of side 6

Solution:

Given: A cube of side 6 cm.

It is cut into a number of cubes each of side 2 cm.

Volume of a cube is given by: a^3 (here ‘a’ is the side of a cube).

Let V_1 be the volume of a cube with side 6cm

$\therefore V_1 = a^3$

$\Rightarrow V_1 = 6^3 = 216\ cm^3$

Let V_2 be the volume of a cube with side 2cm

$\therefore V_1 = a^3$

$\Rightarrow V_1 = 2^3 = 8\ cm^3$

Let ‘n’ be the number of cubes of side 2cm which are cut from cube of side 6cm.

$\therefore n \times V_2 = v_1$

$\Rightarrow n \times 8 = 216$

$\Rightarrow n = \frac{216}{8} = 27$

$\therefore$ Total of 27 cubes each of side 2cm can be cut from a cube of side 6cm.

Question: 46

In a shower, 5 cm

Solution:

Given: 5 cm of rain falls.

2 hectares of ground.

2 hectares = 20000 m^3 ($\because$ 1 hectares = 10000 m^3)

$\therefore$ Area of land which is filled with rain upto 5cm high is 20000 m^3

Let V be the volume of the water on the land.

The volume of the water on the land is: area(of land) × height of the water on the land.

$\therefore$ V = Area(of land) × height

$\Rightarrow V = 20000 \times \frac{5}{100}$ ($\because$ 1cm = $\frac{1}{100}$ m)

$\Rightarrow V = 1000\ m^3$

$\therefore$ The volume of the water that falls on 2 hectares of ground, is: $1000m^3$

Question: 47

Two cubes have th

Solution:

Given: Volumes of the cubes are in the ratio 1:27.

Volume of a cube is given by: a^3 (here ‘a’ is the side of the cube).

Surface are of a cube is given by: a^2 (here ‘a’ is the side of the cube).

Let a_1, a_2 be the side of first cube and second cube respectively.

$\therefore (a_1)^3 : (a_2)^3 = 1:27$

$\Rightarrow a_1 : a_2 = \sqrt[3]{1} : \sqrt[3]{27}$

$\Rightarrow a_1 : a_2 = 1 : 3$

$\Rightarrow (a_1)^2 : (a_2)^2 = 1^2 : 3^2$

$\Rightarrow (a_1)^2 : (a_2)^2 = 1 : 9$

∴ Ratio of the surface areas of the given cubes is 1:9.

Question: 48

The diameter of t

Solution:

Given: Diameter of the base of a cylinder is 4 cm.

Its height is 14 cm.

Volume of the Cylinder is given by: $\pi r^2 h$. (here r and h are radius and diameter respectively)

Let V be the volume of the cylinder.

$\therefore V = \pi r^2 h$

$\Rightarrow V = \pi \times (\frac{4}{2})^2 \times 14$ (∵ 4 is the diameter and $\frac{4}{2}$ is the radius)

$\Rightarrow V = \pi \times (2)^2 \times 14 = \pi \times 4 \times 14$

$\Rightarrow V = 176 \text{ cm}^3$

∴ The volume of the cylinder is 176 cm^3

Question: 49

The diameter of a

Solution:

Given: Diameter of the base of a cylinder is 28 cm.

Its height is 20 cm.

Volume of the Cylinder is given by: $2\pi r(r + h)$. (here r and h are radius and diameter respectively)

Let S be the Surface area of the cylinder.

$\therefore V = 2\pi r(r + h)$

$\Rightarrow S = 2 \times \pi \times (\frac{28}{2}) \times [(\frac{28}{2}) + 20]$ (∵ 28 is the diameter and $\frac{28}{2}$ is the radius)

$\Rightarrow V = 2 \times \pi \times 14 \times (14 + 20) = 2 \times \pi \times 14 \times 24$

$\Rightarrow V = 2992 \text{ cm}^2$

∴ The Surface area of the cylinder is 2992 cm^2

Question: 50

The height of a c

Solution:

Given: The height of a cylinder is 14 cm.

Its curved surface area is 264 cm^2.

Curved surface area of a Cylinder is : $2\pi rh$ (here r and h are radius and height respectively)

$\therefore 2\pi rh = 264$

$\Rightarrow 2 \times \pi \times r \times 14 = 264$

$\Rightarrow r = \frac{264}{2 \times \pi \times 14} = 3cm$

$\therefore$ r = 3cm

Volume of a Cylinder is: $\pi r^2 h$

Let V be the volume of the Cylinder

$\therefore V = \pi r^2 h$

$\Rightarrow V = \pi \times 3^2 \times 14 = 396cm^3$

$\therefore$ Volume of the Cylinder is $396cm^3$

Question: 51

The curved surfac

Solution:

Given: The radius of a cylinder is 14 cm.

Its curved surface area is 1760 cm^2.

Curved surface area of a Cylinder is : $2\pi rh$ (here r and h are radius and height respectively)

$\therefore 2\pi rh = 1760$

$\Rightarrow 2 \times \pi \times 14 \times h = 1760$

$\Rightarrow h = \frac{1760}{2 \times \pi \times 14} = 20$ cm

$\therefore$ h = 20cm

That is height of the given Cylinder is 20cm.

Question: 52

The ratio of the

Solution:

Given: Radius and height of the Cylinder are 80cm and 20cm respectively.

Lateral Surface area of a Cylinder is : $2\pi rh$

Let S_1 be the Lateral surface area of the Cylinder

$\therefore S_1 = 2\pi rh$

$\Rightarrow S_1 = 2 \times \pi \times 80 \times 20 = 3200\pi$

Total Surface area of a Cylinder is : $2\pi r(r + h)$

Let S_2 be the Total surface area of the Cylinder

$\therefore S_2 = 2\pi r(r + h)$

$\Rightarrow S_2 = 2 \times \pi \times 80 \times (80 + 20) = 16000\pi$

Ratio of Total surface area to Lateral surface area id $S_2 : S_1$

$\therefore S_2 : S_1 = 16000\pi : 3200\pi$

$\Rightarrow S_2 : S_1 = 5:1$

$\therefore$ The ratio of the total surface area to the lateral surface area of a cylinder is 5:1

Question: 53

The curved surfac

Solution:

Given: CSA of a cylindrical pillar is 264 m^2

Volume of cylindrical pillar id 924 m^3

CSA of a cylinder is : $2\pi rh$ (here r and h are radius and height respectively)

$\therefore 2\pi rh = 264$ …. 1

Volume of the Cylinder is : $\pi r^2 h$ (here r and h are radius and height respectively)

$\therefore \pi r^2 h = 924$ …. 2

Divide eq –2 by eq –1

We get,

$\frac{\pi \times r \times r \times h}{2 \times \pi \times r \times h} = \frac{924}{264}$

$\Rightarrow \frac{r}{2} = \frac{7}{2} \Rightarrow r = 7$

$\therefore r = 7$

Substitute 'r' in eq –1

$\therefore 2 \times \pi \times 7 \times h = 264$

$\Rightarrow 2 \times \frac{22}{7} \times 7 \times h = 264$

$\Rightarrow 44 \times h=264$

$\Rightarrow h = \frac{264}{44} = 6$ cm

$\therefore$ height of the cylindrical pillar is 6 cm

Question: 54

The ratio between

Solution:

Given: The ratio between the radius of the base and the height of the cylinder is 2: 3.

Volume of the Cylinder is 1617cm^3

Let 2x and 3x be radius and height of the Cylinder respectively.

Volume of the Cylinder is given as: $\pi r^2 h$

$\therefore \pi r^2 h = 1617$

$\Rightarrow \pi \times (2x)^2 \times (3x) = 1617$

$\Rightarrow 12\pi \times x^3 = 1617$

$\Rightarrow x^3 = \frac{1617}{12\pi} = \frac{1617 \times 7}{22 \times 12} = \frac{343}{8}$

$\Rightarrow x = \sqrt[3]{(\frac{343}{8})} = \frac{7}{2}$

$\therefore r = 2 \times \frac{7}{2} = 7$cm

and, $h = 3 \times \frac{7}{2} = 10.5$ cm

Total surface area of a cylinder is: $2\pi rh(r + h)$

Let S be the TSA of a cylinder

$\therefore S = 2\pi rh(r + h)$

$\Rightarrow S = 2 \times \pi \times (7) \times (7 + 10.5) = 2 \times \pi \times (7) \times 17.5 = 770$

$\therefore$ S = 770cm^2

That is, Total surface area of the cylinder is 770 cm^2

Question: 55

The radii of two

Solution:

Given: The radii of two cylinders are in the ratio 2:3.

Heights of the cylinders are in the ratio 5:3.

Volume of cylinder is: $\pi r^2 h$ (here r and h are radius and height of the cylinder respectively)

Let V_1 be the volume of first cylinder

$\therefore V_1 = \pi(r_1)^2 h_1$

Let V_2 be the volume of second cylinder

$\therefore V_2 = \pi(r_2)^2 h_2$

$\therefore V_1 : V_2 = \pi(r_1)^2 h_1 : \pi(r_2)^2 h_2$

$\Rightarrow V_1 : V_2 = \pi \times (2)^2 \times 5 : \pi \times (3)^2 \times 3$

$\Rightarrow V_1 : V_2 = 20\pi : 27\pi = 20:27$

$\therefore V_1 : V_2 = 20:27$

That is the ratio of their volume is 20:27.

Question: 56

Two circular cyli

Solution:

Given: Two cylinders of equal volume.

Heights of the cylinders are in the ratio 1:2

Volume of cylinder is: $\pi r^2 h$ (here r and h are radius and height of the cylinder respectively)

Let V_1 be the volume of first cylinder

$\therefore V_1 = \pi(r_1)^2 h_1$

Let V_2 be the volume of second cylinder

$\therefore V_2 = \pi(r_2)^2 h_2$

Here,

$V_1 = V_2$

$\Rightarrow \pi(r_1)^2 h_1 = \pi(r_2)^2 h_2$

$\Rightarrow (r_1)^2 h_1 = (r_2)^2 h_2$

$\Rightarrow (r_1)^2 : (r_2)^2 = h_2 : h_1$

$\Rightarrow (r_1)^2 : (r_2)^2 = 2 : 1$

$\Rightarrow r_1 : r_2 = \sqrt{2} : 1$

$\therefore$ ratio of the radii of given cylinders is $\sqrt{2} : 1$

Question: 57

The radius of the

Solution:

Given: The height of the cone is 12 cm.

The radius of the cone is 5 cm.

Curved surface area of a cone is : πrl (here r and l are radius and slant height respectively)

$l = \sqrt{(r^2 + h^2)}$

$\therefore \pi rl = \pi r\sqrt{(r^2 + h^2)}$

Let S be the CSA of the cone.

$\therefore S = \pi r\sqrt{(r^2 + h^2)}$

$\Rightarrow S = \pi \times (5) \times \sqrt{((5)^2 + (12)^2)}$

$\Rightarrow S = \pi \times (5) \times \sqrt{(25 + 144)} = \pi \times (5) \times \sqrt{(169)}$

$\Rightarrow S = \pi \times (5) \times 13 = 65\pi$

$\therefore S = 65\pi\ cm^2$

That is CSA of the cone is $65\pi\ cm^2$

Question: 58

The diameter of t

Solution:

Given: Diameter of the base of a cone is 42 cm.

Volume of the cone is 12936 cm^3.

Volume of the cone is given by: $\frac{1}{3} \times \pi \times r^2 \times h$

$\therefore \frac{1}{3} \times \pi \times r^2 \times h = 12936$

$\Rightarrow \frac{1}{3} \times \pi \times (\frac{42}{2})^2 \times h = 12936$ (here diameter = 42cm, $\therefore r = \frac{42}{2} = 21$)

$\Rightarrow \frac{1}{3} \times \pi \times (21)^2 \times h = 12936$

$\Rightarrow h = \frac{12936 \times 3}{\pi \times 21 \times 21} = 28cm$

$\therefore$ Height of the given cone is 28cm

Question: 59

The area of the b

Solution:

Given: Area of the base of a right circular cone is 154 cm^2.

Height of the cone is 14 cm.

Curved surface area of a cone is : πrl (here r and l are radius and slant height respectively)

Area of the base is given by: πr^2

$\therefore \pi \times r^2 = 154$

$\Rightarrow r^2 = \frac{154}{\pi} = 49$

$\Rightarrow r = \sqrt{49} = 7cm$

$\therefore$ radius of the base of the cone is 7cm

Now,

$l = \sqrt{(r^2 + h^2)}$

$\therefore \pi rl = \pi r\sqrt{(r^2 + h^2)}$

Let S be the CSA of the cone.

$\therefore S = \pi r\sqrt{(r^2 + h^2)}$

$\Rightarrow S = \pi \times (7) \times \sqrt{((7)^2 + (14)^2)}$

$\Rightarrow S = \pi \times (7) \times \sqrt{(49 + 196)} = \pi \times (7) \times \sqrt{(245)}$

$\Rightarrow S = \pi \times (7) \times 7\sqrt{5} = \frac{22}{7} \times 7 \times 7\sqrt{5} = 154\sqrt{5}$

$\therefore S = 154\sqrt{5}\ cm^2$

That is CSA of the cone is $154\sqrt{5}\ cm^2$

Question: 60

On increasing eac

Solution:

Given: Radius of the base and the height of a cone is increased by 20%

The volume of the cone is : $\frac{1}{3}\pi r^2 h$

New radius = $r + \frac{20}{100}r = \frac{120}{100}r = \frac{6}{5}r$

Similarly, new radius = $\frac{6}{5}h$

New Volume = $\frac{1}{3} \times \pi \times (\frac{6}{5}r)^2 \times (\frac{6}{5}h) = \frac{216}{125} \times \frac{1}{3}\pi r^2 h$

Increase in volume = $\frac{216}{125} \times \frac{1}{3}\pi r^2 h - \frac{1}{3}\pi r^2 h = \frac{91}{125} \times \frac{1}{3}\pi r^2 h$

$\therefore$ Increase in % =$\left(\frac{\frac{91}{125} \times \frac{1}{3}\pi r2h}{\frac{1}{3}\pi r2h} \times 100\right)\% = 72.8\%$

$\therefore$ Volume will be increased by 72.8%

Question: 61

The radii of the

Solution:

Given: The radii of the base of a cylinder and a cone are in the ratio 3:4.

Heights of the base of a cylinder and a cone are in the ratio 2:3.

Volume of cylinder is: $\pi r^2 h$ (here r and h are radius and height of the cylinder respectively)

Volume of cylinder is: $\pi r^2 h$

Let V_1 be the volume of first cylinder

$\therefore V_1 = \pi(r_1)^2 h_1$

Let V_2 be the volume of the cone.

$\therefore V_2 = \frac{1}{3}\pi(r_2)^2 h_2$

$\therefore V_1 : V_2 = \pi(r_1)^2 h_1 : \frac{1}{3}\pi(r_2)^2 h_2$

$\Rightarrow V_1 : V_2 = \pi \times (3)^2 \times 2 : \frac{1}{3} \times \pi \times (4)^2 \times 3$

$\Rightarrow V_1 : V_2 = 18\pi : \frac{1}{3} \times 48\pi = 18:16 = 9:8$

$\therefore V_1 : V_2 = 9:8$

That is the ratio of their volume is 9:8.

Question: 62

A metallic Cylind

Solution:

Given: A metallic Cylinder of radius 8cm and height 2cm

Right circular cone of height 6cm

Volume of a cylinder is given by: $\pi \times r^2 \times h$

Volume of a cone is given by: $\frac{1}{3} \times \pi \times r^2 \times h$

Let V_1 be the volume of the Cylinder

$\therefore V_1 = \pi \times r^2 \times h$

$\Rightarrow V_1 = \pi \times (8)^2 \times (2) = 128\pi$

Let V_2 be the volume of the cone

$\therefore V_2 = \frac{1}{3} \times \pi \times r^2 \times h$

$\Rightarrow V_2 = \frac{1}{3} \times \pi \times (r)^2 \times (6) = 2\pi r^2$

Here, Solid Cylinder is melted and made into a Solid cone.

$\therefore V_1 = V_2$

$\Rightarrow 128\pi = 2\pi r^2$

$\Rightarrow 2\pi r^2 = 128\pi$

$\Rightarrow r^2 = \frac{128\pi}{2\pi} = 64$

$\Rightarrow r^2 = 64$

$\Rightarrow r = \sqrt{64} = 8cm$

$\therefore$ Radius of the base of the cone is 8cm.

Question: 63

The height of the

Solution:

Given: The height of the conical tent is 14m and its floor area is $346.5m^2$.

Canvas of width 1.1m

Surface area of the tent is: πrl

Let be the Surface area of the cone.

Area of the floor is : $\pi r^2 = 346.5\ m^2$

$\Rightarrow \pi r^2 = 346.5$

$\Rightarrow r^2 = \frac{346.5}{\pi} = \frac{441}{4}$

$\Rightarrow r = \sqrt{(\frac{441}{4})} = \frac{21}{2}$

⇒ $l = \sqrt{(h^2 + r^2)}$ (here l is the slant height and h , r are height and radius respectively of cone)

⇒ $l = \sqrt{(14^2 + (\frac{21}{2})^2)} = \sqrt{(196 + \frac{441}{4})} = \sqrt{\frac{1225}{4}} = \frac{35}{2}$

∴ $S = \pi rl = \pi \times \frac{21}{2} \times \frac{35}{2} = \frac{33 \times 35}{2}$

∴ Area of the canvas required to cover the tent is: $\frac{33 \times 35}{2}$ m^2

∴ $l \times b = \frac{33 \times 35}{2}$ m^2 (here l is length and b is breadth or width of the canvas)

⇒ $l \times 1.1 = \frac{33 \times 35}{2}$ (width of the canvas is 1.1m)

⇒ $l = \frac{33 \times 35}{2 \times 1.1} = 525$m

∴ Length of the canvas required to cover the tent is 525m

Question: 64

The diameter of a

Solution:

Given: Diameter of the sphere is 14cm

Radius of the sphere is $\frac{14}{2} = 7$cm

Volume of the Sphere is given by: $\frac{4}{3}\pi r^3$ (here r is the radius of the sphere)

Let V be the volume of the sphere)

∴ $V = \frac{4}{3}\pi r^3$

⇒ $V = \frac{4}{3}\pi(7)^3 = \frac{4}{3} \times \frac{22}{7} \times 343$

⇒ $V = \frac{4}{3} \times 22 \times 49 = \frac{4312}{3} = 1437\frac{1}{3}$

∴ Volume of the sphere is $1437\frac{1}{3}$

Question: 65

The ratio between

Solution:

Given: Volumes of the spheres are in the ratio 8:27.

Volume of a sphere is given by: $\frac{4}{3}\pi r^3$ (here ‘r’ is the radius of the sphere).

Surface are of a sphere is given by: $4\pi r^2$ (here ‘r’ is the radius of the sphere).

Let r_1, r_2 be the radii of first sphere and second sphere respectively.

∴ $\frac{4}{3}\pi(r_1)^3 : \frac{4}{3}\pi(r_2)^3 = 2:27$

⇒ $(r_1)^3 : (r_2)^3 = 8 : 27$

⇒ $r_1 : r_2 = \sqrt[3]{8} : \sqrt[3]{27}$

⇒ $(r_1) : (r_2) = 2 : 3$

Now , here

$4\pi(r_1)^2 : 4\pi(r_2)^2 = (r_1)^2 : (r_1)^2$

⇒ $(r_1)^2 : (r_1)^2 = (2)^2 : (3)^2 = 4:9$

∴ Ratio of the surface areas of the given spheres is 4:9.

Question: 66

A hollow metallic

Solution:

Given: A hollow metallic Sphere with external diameter8cm and internal diameter 4cm

A cone having base diameter 8cm

Radius of the cone is: $\frac{8}{2}$ = 4cm

External Radius of the sphere is $\frac{8}{2}$ = 4cm

Internal Radius of the sphere is $\frac{4}{2}$ = 2cm

Volume of a Hollow Sphere is given by: $\frac{4}{3}\pi((r_1)^3 - (r_2)^3)$ (here r_1 and r_2 are External and internal radii of the hollow sphere respectively)

Let V_1 be the Volume of the Hollow sphere.

$\therefore V_1 = \frac{4}{3}\pi((r_1)^3 - (r_2)^3)$

$\Rightarrow V_1 = \frac{4}{3}\pi((4)^3 - (2)^3) = \frac{4}{3}\pi(64 - 8) = \frac{4}{3}\pi(56)$

Volume of the cone is given by $\frac{1}{3} \times \pi \times r^2 \times h$

Let V_2 be the volume of the cone

$\therefore V_2 = \frac{1}{3} \times \pi \times r^2 \times h$

$\Rightarrow V_2 = \frac{1}{3} \times \pi \times (4)^2 \times h$

Here, Hollow sphere is melted and moulded into a cone.

$\therefore V_1 = V_2$

$\Rightarrow \frac{4}{3}\pi(56) = \frac{1}{3} \times \pi \times (8)^2 \times h$

$\Rightarrow \frac{1}{3} \times \pi \times 16 \times h = \frac{4}{3} \times \pi \times (56)$

$\Rightarrow h = \frac{\frac{4}{3} \times \pi \times (56)}{\frac{1}{3} \times \pi \times 16} = 14\text{cm}$

∴ Height of the cone is 14cm

Question: 67

A metallic cone h

Solution:

Given: A metallic cone having base radius 2.1 cm and height 8.4 cm

Volume of a cone is given by: $\frac{1}{3} \times \pi \times r^2 \times h$

Let V_1 be the volume of the cone

$\therefore V_1 = \frac{1}{3} \times \pi \times r^2 \times h$

$\Rightarrow V_1 = \frac{1}{3} \times \pi \times (2.1)^2 \times (8.4)$

Volume of a sphere is given by: $\frac{4}{3} \times \pi \times r^3$

Let V_2 be the volume of the cone

$\therefore V_1 = \frac{4}{3} \times \pi \times r^3$

Here,

$V_1 = V_2$

$\therefore \frac{1}{3} \times \pi \times (2.1)^2 \times (8.4) = \frac{4}{3} \times \pi \times r^3$

$\Rightarrow r^3 = \frac{1}{3} \times \pi \times (2.1)^2 \times (8.4) \times \frac{3}{4\pi} = (2.1)^3$

$\Rightarrow r^3 = (2.1)^3$

$\Rightarrow r = \sqrt[3]{(2.1)^3} = 2.1$ cm

$\therefore$ Radius of the sphere is 2.1 cm

Question: 68

The volume of a h

Solution:

Given: The volume of a hemisphere is 19404 cm^3.

Volume of the hemisphere is given by: $\frac{2}{3} \times \pi \times r^3$

$\therefore \frac{2}{3} \times \pi \times r^3 = 19404$

$\Rightarrow r^3 = 19404 \times \frac{3}{2\pi} = 9261$

$\Rightarrow r^3 = 9261 \Rightarrow r = \sqrt[3]{9261}$

$\Rightarrow r = 21$

Now, Total surface area of hemisphere is given by: $3\pi r^2$

Let S be the TSA

$\therefore S = 3 \times \pi \times r^2$

$\Rightarrow S = 3 \times \pi \times (21)^2 = 4158\ cm^2$

$\therefore S = 4158\ cm^2$

That is TSA of the given sphere is 4158 cm^2

Question: 69

The surface area

Solution:

Given: The surface area of a sphere is 154 cm^2.

TSA of the sphere is given by: $4 \times \pi \times r^2$

$\therefore 4 \times \pi \times r^2 = 154$

$\Rightarrow r^2 = 154 \times \frac{1}{4\pi} = \frac{49}{4}$

$\Rightarrow r^2 = \frac{49}{4} \Rightarrow r = \sqrt{\frac{49}{4}}$

$\Rightarrow r = \frac{7}{2}$

Now, Volume of hemisphere is given by: $\frac{4}{3}\pi r^3$

Let V be the Volume of the hemisphere

$\therefore V = \frac{4}{3} \times \pi \times r^3$

$\Rightarrow V = \frac{4}{3} \times \pi \times (\frac{7}{2})^3 = \frac{539}{3}\ cm^3 = 179\ \frac{2}{3} cm^3$

$\therefore V = 179\ \frac{2}{3} cm^3$

That is Volume of the given sphere is $179\ \frac{2}{3} cm^3$

Question: 70

The total surface

Solution:

Given: Radius of the hemisphere: 7cm .

TSA of the hemisphere is given by: $3\pi r^2$

Let S be the TSA of the hemisphere.

$\therefore S = 3\pi r^2$

$\Rightarrow S = 3 \times \pi \times (7)^2 = 147\pi\ cm^2$

$\therefore$ TSA of the hemisphere is $147\pi\ cm^2$

Question: 71

The circular ends

Solution:

Given: The circular ends of a bucket are of radii 35 cm and 14 cm and the height of the bucket is 40 cm.

Bucket is in the shape of frustum.

Let V be the Volume of the Bucket(Frustum)

Volume of the frustum is given by: $\frac{\pi}{3} \times h \times (R^2 + r^2 + Rr)$ (here r and R are the radii of smaller and larger circular ends respectively)

$\therefore V = \frac{\pi}{3} \times h \times (R^2 + r^2 + R \times r)$

$\Rightarrow V = \frac{\pi}{3} \times 40 \times (35^2 + 14^2 + 35 \times 14)$

$\Rightarrow V = \frac{\pi}{3} \times 40 \times (1225 + 196 + 490) = \frac{\pi}{3} \times 40 \times (1911)$

$\Rightarrow V = \frac{\pi}{3} \times 40 \times (1911) = 80080\ cm^3$

$\therefore$ The volume of the bucket is: $80080\ cm^3$

Question: 72

If the radii of t

Solution:

Given: The radii of the end of a bucket are 5 cm and 15 cm and it is 24 cm high

Bucket is in the shape of frustum.

TSA of a frustum of a cone = $\pi l(r_1 + r_2) + \pi r_1{}^2 + \pi r_2{}^2$ (here l , r_1, r_2 are the slant height, radii of the frustum)

Let S be the TSA of the bucket

$\therefore S = \pi l(r_1 + r_2) + \pi(r_2)^2$ (here , top of the bucket is not closed but bottom is closed, $\therefore \pi(r_2)^2 = 0$

)

$l = \sqrt{(h^2 + (R-r)^2)}$

$\Rightarrow S = \pi \times \sqrt{(h^2 + (R-r)^2)} \times (r_1 + r_2) + \pi(r_2)^2$

$\Rightarrow S = \pi \times \sqrt{(24^2 + (15-5)^2)} \times (5 + 15) + \pi \times (5)^2$

$\Rightarrow S = \pi \times \sqrt{(576 + 100)} \times (20) + \pi \times 25$

$\Rightarrow S = \pi \times \sqrt{(676)} \times (20) + \pi \times 25$

$\Rightarrow S = \pi \times 26 \times (20) + \pi \times 25$

$\Rightarrow S = \pi \times 520 + \pi \times 25$

$\Rightarrow S = \pi \times (520 + 25)$

$\Rightarrow S = 3.14 \times 545 = 1711.3\ cm^2$

$\therefore$ The surface area of the bucket is 1711.3 cm^2

Question: 73

A circus tent is

Solution:

Given: A circus tent is cylindrical to a height of 4 m and conical above it.

Its diameter is 105 m and its slant height is 40 m.

CSA of the Cylinder is given by: $2\pi rh$ (here, r and h are radius and height respectively)

Let V_1 be the CSA of the cylindrical part of tent

$\therefore V_1 = 2\pi rh$

$\Rightarrow V_1 = 2 \times \pi \times \frac{105}{2} \times 4 = 1320cm^2$ (here diameter is 105 cm, $\therefore$ radius = $\frac{105}{2}$ cm)

CSA of the cone is given by: πrl (here, r and l are radius and slant height respectively)

Let V_2 be the CSA of the conical part of tent

$\therefore V_2 = \pi rl$

$\Rightarrow V_2 = \pi \times \frac{105}{2} \times 40 = 6600\ cm^2$ (here diameter is 105 cm, $\therefore$ radius = $\frac{105}{2}$ cm)

$\therefore$ Total area of the canvas is $V_1 + V_2$

$\therefore V_1 + V_2 = 1320 + 6600 = 7920cm^2$

$\therefore$ Total area of the canvas is: 7920 cm^2

Question: 74

Match the followi

Solution:

a—(q), b—(s), c—(p), d—(r)

a) Given: A solid metallic sphere of radius 8 cm

Solid right cones with height 4 cm and radius of the base 8 cm.

Volume of a metallic sphere is given by: $\frac{4}{3} \times \pi \times r^3$

Volume of a Right cone is given by: $\frac{1}{3} \times \pi \times r^2 \times h$

Let V_1 be the Volume of the metallic sphere.

$\therefore V_1 = \frac{4}{3} \times \pi \times r^3 = \frac{4}{3} \times \pi \times (8)^3$

Let V_2 be the Volume of the Solid right cone.

$\therefore V_2 = \frac{1}{3} \times \pi \times r^2 \times h = \frac{1}{3} \times \pi \times (8)^2 \times 4$

Let 'n' be the number of right circular cones that are made from melting the metallic sphere.

$\therefore V_1 = n \times V_2$

$\frac{4}{3} \times \pi \times (8)^3 = n \times \frac{1}{3} \times \pi \times (8)^2 \times 4$

$n = \frac{\frac{4}{3} \times \pi \times 8 \times 8 \times 8}{\frac{1}{3} \times \pi \times 8 \times 8 \times 4} = 8$

$\therefore$ 8 cones are formed from melting the metallic sphere.

b) Given: A 20-m-deep well with diameter 14 m $\Rightarrow$ radius = 7cm

A platform 44 m by 14 m

Volume of a cylinder is given by: $\pi \times r^2 \times h$

Volume of a platform(cuboid) is given by: $l \times b \times h$ (here l, b, h are length, breadth, height respectively)

Let V_1 be the Volume of the Well.

$\therefore V_1 = \pi \times r^2 \times h = \pi \times (7)^2 \times 20$

Let V_2 be the Volume of the platform

$\therefore V_2 = l \times b \times h = 44 \times 14 \times h$

Here $V_1 = V_2$

$\therefore 44 \times 14 \times h = \pi \times (7)^2 \times 20$

$\Rightarrow h = = \frac{\pi \times 7 \times 7 \times 20}{44 \times 14} = 5cm$

$\therefore h = 5cm$

That is height of the platform is 5cm.

c) Given: A sphere of radius 6 cm

A cylinder of radius 4 cm

Volume of a metallic sphere is given by: $\frac{4}{3} \times \pi \times r^3$

Volume of a Cylinder is given by: $\pi \times r^2 \times h$

Let V_1 be the Volume of the metallic sphere.

$\therefore V_1 = \frac{4}{3} \times \pi \times r^3 = \frac{4}{3} \times \pi \times (6)^3$

Let V_2 be the Volume of the Solid Cylinder.

$\therefore V_2 = \pi \times r^2 \times h = \pi \times (4)^2 \times h$

Here $V_1 = V_2$

$\therefore \pi \times (4)^2 \times h = \frac{4}{3} \times \pi \times (6)^3$

$\Rightarrow h = \frac{\frac{4}{3} \times \pi \times 6 \times 6 \times 6}{\pi \times 4 \times 4} = 18cm$

$\therefore h = 18cm$

That is height of the cylinder is 18 cm.

d) Given: Volume ratio of two Spheres is: 64:27

Volume of the Sphere is: $\frac{4}{3} \times \pi \times r^3$ (where r is radius of sphere)

Surface area of the sphere is: $4 \times \pi \times r^2$ (where r is radius of sphere)

Let V_1 and V_2 be the volumes of different spheres.

$V_1 : V_2 = 64:27$

$\frac{4}{3} \times \pi \times (r_1)^3 : \frac{4}{3} \times \pi \times (r_2)^3 = 64:27$ (here r_1 and r_2 are the radii of V_1 and V_2 respectively)

$(r_1)^3 : (r_2)^3 = 64:27$

$r_1 : r_2 = \sqrt[3]{64} : \sqrt[3]{27}$

$r_1 : r_2 = 4:3$

Now,

Let S_1 and S_2 be the Surface areas of the spheres.

$\therefore S_1 : S_2 = 4 \times \pi \times (r_1)^2 : 4 \times \pi \times (r_2)^2$ (here r_1 and r_2 are the radii of S_1 and S_2 respectively)

$\Rightarrow S_1 : S_2 = (r_1)^2 : (r_2)^2$

$\Rightarrow S_1 : S_2 = (4)^2 : (3)^2$

$\Rightarrow S_1 : S_2 = 16:9$

$\therefore$ The ratios of the Surface areas is: 16:9

Question: 75

Match the followi

Solution:

a—(q), b—(s), c—(p), d—(r)

a) Given: The radii of the circular ends of a bucket are 20 cm and 10 cm respectively.

Height of the bucket is 30cm

Bucket is in the shape of frustum.

Let V be the Volume of the Bucket(Frustum)

Volume of the frustum is given by: $\frac{\pi}{3} \times h \times (R^2 + r^2 + Rr)$ (here r and R are the radii of smaller and larger circular ends respectively)

$\therefore V = \frac{\pi}{3} \times h \times (R^2 + r^2 + R \times r)$

$\Rightarrow V = \frac{\pi}{3} \times 30 \times (20^2 + 10^2 + 20 \times 10)$

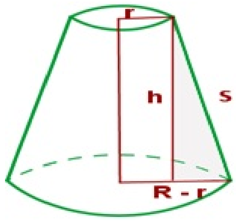
$\Rightarrow V = \frac{\pi}{3} \times 30 \times (400 + 100 + 200) = \frac{\pi}{3} \times 30 \times (700)$

$\Rightarrow V = \frac{\pi}{3} \times 30 \times (700) = 22000\ cm^3$

$\therefore$ The capacity of the bucket is: $22000\ cm^3$

b) Given: Height of the frustum of a cone: 15 cm

radii of the Circular ends: 28cm and 20 cm.



Here slant height h can be found by using Pythagoras theorem.

$\therefore s^2 = h^2 + (R\text{-}r)^2$ (here R is 28cm and r is 20cm)

$\Rightarrow s^2 = 15^2 + (28—20)^2$

$\Rightarrow s^2 = 15^2 + (8)^2$

$\Rightarrow s^2 = 225 + 64$

$\Rightarrow s^2 = 289$

$\Rightarrow s = \sqrt{289} = 17$

$\therefore$ Slant height 0f the Frustum is 17cm

c) Given: The radii of the end of a bucket are 33 cm and 27 cm and its slant height is 10 cm

TSA of a frustum of a cone = $\pi l(r_1 + r_2) + \pi {r_1}^2 + \pi {r_2}^2$ (here l , r_1, r_2 are the slant height, radii of the frustum)

Let S be the TSA of the Frustum.

$\therefore S = \pi l(r_1 + r_2) + \pi(r_2)^2 + \pi(r_1)^2$

$\Rightarrow S = \pi \times 10 \times (33 + 27) + \pi(33)^2 + \pi(27)^2$

$\Rightarrow S = \pi(600 + 1089 + 729) = 2418\pi$

$\therefore$ TSA of frustum is 2418π.

d) Given: Three solid metallic sphere of radii 3 cm, 4 cm and 5 cm.

Volume of the Solid sphere is: $\frac{4}{3}\pi r^3$ (here r is the radius of the sphere).

Let V_1 be the volume of the sphere with radius 3cm.

Let V_2 be the volume of the sphere with radius 4cm.

Let V_3 be the volume of the sphere with radius 5cm.

$\therefore V_1 = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(3)^3$

$\therefore V_2 = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(4)^3$

$\therefore V_3 = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi(5)^3$

Here,

Let V be the Volume of the sphere that is formed by melting the spheres with volumes V_1 , V_2 , V_3 .

$\therefore V = V_1 + V_2 + V_3 = \frac{4}{3}\pi(3)^3 + \frac{4}{3}\pi(3)^3 + \frac{4}{3}\pi(3)^3$

$\Rightarrow V = \frac{4}{3}\pi(3^3 + 4^3 + 5^3) = \frac{4}{3}\pi(27 + 64 + 125) = \frac{4}{3}\pi(216)$

$\Rightarrow V = \frac{4}{3}\pi(216) = \frac{4}{3}\pi(6)^3$

Here, we can see that radius of the Sphere is 6cm, $\therefore$ diameter = 2×6 = 12cm

∴ Diameter of sphere formed by melting spheres with volumes V_1, V_2 , V_3 is 12cm

Question: 76

Each question con

Solution:

Assertion is wrong and Reason is Wrong.

Explanation:

Assertion (A):

Given: The radii of the end of a bucket are 5 cm and 15 cm and it is 24 cm high

Bucket is in the shape of frustum.

TSA of a frustum of a cone = $\pi l(r_1 + r_2) + \pi r_1^2 + \pi r_2^2$ (here l , r_1, r_2 are the slant height, radii of the frustum)

Let S be the TSA of the bucket

$\therefore S = \pi l(r_1 + r_2) + \pi(r_2)^2$ (here , top of the bucket is not closed but bottom is closed, $\therefore \pi(r_2)^2 = 0$)

$l = \sqrt{(h^2 + (R-r)^2)}$

$\Rightarrow S = \pi \times \sqrt{(h^2 + (R-r)^2)} \times (r_1 + r_2) + \pi(r_2)^2$

$\Rightarrow S = \pi \times \sqrt{(24^2 + (15-5)^2)} \times (5 + 15) + \pi \times (5)^2$

$\Rightarrow S = \pi \times \sqrt{(576 + 100)} \times (20) + \pi \times 25$

$\Rightarrow S = \pi \times \sqrt{(676)} \times (20) + \pi \times 25$

$\Rightarrow S = \pi \times 26 \times (20) + \pi \times 25$

$\Rightarrow S = \pi \times 520 + \pi \times 25$

$\Rightarrow S = \pi \times (520 + 25)$

$\Rightarrow S= 3.14 \times 545 = 1711.3\ cm^2$

∴ The surface area of the bucket is $1711.3\ cm^2$

Reason(R):

Here,

Surface area is $\pi \{R^2 + r^2 + l(R + r)\}$,where $l^2 = h^2 + (R - r)^2$.

Assertion is wrong and Reason is Wrong.

Question: 77

Each question con

Solution:

Assertion is wrong and Reason is correct.

Explanation:

Assertion (A):

Given: A hemisphere of radius 7 cm.

Total surface area of the hemisphere is: $3\pi r^2$

Let S be the TSA of the hemisphere.

$\therefore S = 3\pi r^2 = 3\pi(7)^2$

$\therefore S = 462 cm^2$

The total cost to pain it: 462×5 = Rs 2310

Reason(R):

The total surface area of a hemisphere is $3\pi r^2$.

∴ Assertion is wrong and Reason is correct.

Question: 78

Each question con

Solution:

Assertion is correct and Reason is correct explanation of the given assertion.

Explanation:

Assertion (A):

Given: A coin which is 1.75 cm in diameter and 2 mm thick.

A cuboid with dimensions (10cm × 5.5cm × 3.5cm)

A coin is in the form of a cylinder.

Volume of the Cylinder is given by: $\pi r^2 h$

Let V_1 be the volume of the coin.

$\therefore V_1 = \pi r^2 h$

$\Rightarrow V_1 = \pi \times (\frac{1.75}{2})^2 \times \frac{2}{10}$ (here, 1.75 is the diameter,∴ radius = $\frac{1.75}{2}$, and 1mm = $\frac{1}{10}$ cm)

$\Rightarrow V_1 = \pi \times (0.875)^2 \times 0.2 = \frac{77}{160}$ cm^2

Volume of a cuboid is given by: $l \times b \times h$

Let V_2 be the volume of the of the cuboid.

$\therefore V_2 = l \times b \times h$

$\Rightarrow V_2 = 10 \times 5.5 \times 3.5 = 192.5$ cm^2

Let ‘n’ be the number of coin melted .

$\therefore n \times V_1 = V_2$

$\Rightarrow n \times \frac{77}{160} = 192.5$

$\Rightarrow n = 192.5 \times \frac{160}{77} = 400$

$\therefore n = 400$

That is 400 coin when melted can be moulded into a cuboid of given dimensions.

Reason(R):

Volume of a cylinder of base radius r and height h is given by V= ($\pi r^2 h$) cubic units. And, area of a cuboid = ($l \times b \times h$) cubic units.

∴ Assertion is correct and Reason is correct explanation of the given assertion.

Question: 79

Each question con

Solution:

Assertion is wrong and Reason is Wrong.

Explanation:

Assertion (A):

Given: volumes of two sphere are in the ratio 27:8.

Volume of the sphere is given by: $\frac{4}{3}$ πr^3

Let V_1 be the volume of the first sphere.

Let V_2 be the volume of the first sphere.

$\therefore V_1:V_2 = \frac{4}{3}\pi(r_1)^3 : \frac{4}{3}\pi(r_2)^3$

$\Rightarrow 27:8 = (r_1)^3 : (r_2)^3$

$\Rightarrow r_1 : r_2 = 3:2$

Surface area of the sphere is given by: $4\pi r^2$

Let S_1 be the Surface area of the sphere.

Let S_2 be the Surface area of the sphere.

$\therefore S_1 : S_2 = 4\pi(r_1)^2 : 4\pi(r_2)^2$

$\Rightarrow S_1 : S_2 = (r_1)^2 : (r_2)^2$

$\Rightarrow S_1 : S_2 = (3)^2 : (2)^2$

$\Rightarrow S_1 : S_2 = 9:4$

Reason(R):

Volume of a sphere = $\frac{4}{3}\pi r^3$.

Surface area of a sphere = $4\pi R^2$.

Assertion is wrong and Reason is Wrong.

Question: 80

Each question con

Solution:

Assertion is correct and Reason is Wrong.

Explanation:

Assertion (A):

Given: A cone of radius 3cm and height 4cm.

CSA of the cone is given by: πrl (here r is radius and l is slant height)

$l = \sqrt{(h^2 + r^2)}$

Let S be the CSA of the cone

$\therefore S = \pi rl = \pi \times r \times \sqrt{(h^2 + r^2)}$

$\Rightarrow S = \pi \times 4 \times \sqrt{(4^2 + 3^2)} = \pi \times 3 \times \sqrt{(16 + 9)} = \pi \times 3 \times \sqrt{(25)} = \pi \times 3 \times 5 = 15\pi$

$\therefore S = 15\pi$

Reason (R):

Volume of a cone is : $\frac{1}{3}\pi r^2 h$

$\therefore$ Assertion is correct and Reason is Wrong.

Exercise : FORMATIVE ASSESSMENT (UNIT TEST)

Question: 1

Find the number o

Solution:

Given: Diameter of each solid sphere = 6 cm

∴ Radius of each sphere = 6/2 = r_s = 3 cm

Diameter of cylinder = 4 cm

∴ Radius of cylinder = 4/2 = r_c = 2 cm

Height of cylinder = h = 45 cm

Formula: volume of sphere = $(4/3) \times \pi \times r_s^3$

Volume of cylinder = $\pi \times r_c^2 \times h$

Spheres are moulded to form cylinder which means the volume remains the same

Let ‘n’ be the number of spheres required

i.e. volume of n spheres = volume of cylinder

∴ $n \times (4/3) \times \pi \times 3^3 = \pi \times 2^2 \times 45$

$n \times 4 \times 27 = 4 \times 3 \times 45$

n = 45/9 = 5

Number of solid spheres made = 5

Question: 2

Two right circula

Solution:

Let the two cylinders be with volume V_1 and V_2 with their respective radii and height as r_1, r_2 and h_1, h_2

Now given ratio of their heights i.e. $h_1:h_2 = 1:2$

∴ $h_1/h_2 = 1/2$

Volume of cylinder = $\pi r^2 h$

Given that volumes of both cylinder are equal i.e. $V_1 = V_2$

∴ $\pi \times r_1^2 \times h_1 = \pi \times r_2^2 \times h_2$

$h_1/h_2 = r_2^2/ r_1^2$

$r_2^2/ r_1^2 = 1/2$

$r_2/r_1 = 1/\sqrt{2}$

$r_1/r_2 = \sqrt{2}/1$

Therefore the ratio of their radii is $r_1:r_2 = \sqrt{2}:1$

Question: 3

A circus tent is

Solution:

Given: diameter of base of cone and the cylinder = 105 m

∴ Radius of cylinder = r_{cl} = 105/2 = 51 m

Radius of cone = r_{co} = 105/2 = 51 m

Height of cylinder = h = 4 m

Slant height of cone = l = 40 m

Formula: Surface area of cylinder = $2\pi r_{cl}h + 2\pi r_{cl}^2$

Surface area of cone = $\pi r_{co}^2 + \pi r_{co}l$

Since we don't require canvas for the top surface and bottom surface of cylinder and also for the base of cone we should subtract those areas from the surface area

Area of upper and lower surfaces of cylinder = $2\pi r_{cl}^2$

∴ Area of canvas required for cylinder = $2\pi r_{cl}h + 2\pi r_{cl}^2 - 2\pi r_{cl}^2$

= $2\pi r_{cl}h$

= 2 × 3.14 × 51 × 4

= 1281.12 m^2

Area of base of cone = πr_{co}^2

∴ area of canvas required for cone = $\pi r_{co}^2 + \pi r_{co}l - \pi r_{co}^2$

= $\pi r_{co}l$

= 3.14 × 51 × 40

= 6405.6 m^2

Total area of canvas required = Area of canvas required for cylinder + area of canvas

required for cone

= 1281.12 + 6405.6

= 7686.72 m^2

∴ Total area of canvas required = 7686.72 m^2

Question: 4

The radii of the

Solution:

Given: slant height of bucket = l = 45 cm

Radius of bottom circle = r = 7 cm

Radius of top circle = R = 28 cm

As the bucket is in the form of frustum

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l$ cm^2

Now we have asked curved surface area, so we should subtract the top and bottom surface

areas which are flat circles.

Surface area of top = πr^2

Surface area of bottom = πR^2

∴ Curved surface area = total surface area – $\pi r^2 - \pi R^2$ cm^2

= $\pi r^2 + \pi R^2 + \pi(R + r)l - \pi r^2 - \pi R^2$ cm^2

= $\pi(R + r)l$ cm^2

$= 3.14 \times (28 + 7) \times 45\ cm^2$

$= 3.14 \times 35 \times 45\ cm^2$

$= 4945.5\ cm^2$

Therefore, curved surface area of bucket = $4945.5\ cm^2$

Question: 5

A solid metal con

Solution:

Given: base radius of cone = $r_c = 12$ cm

Height of cone = h = 24 cm

Diameter of spherical ball = 6 cm

Radius of spherical ball = $r_s = 6/2 = 3$ cm

Formula: volume of cone = $(1/3)\pi r_c^2 h$

Volume of sphere = $(4/3)\pi r_s^3$

Let n be the number of spherical balls made

As the cone is melted and then the spherical balls are made therefore the volume remains same

i.e. volume of n spherical balls made = volume of cone

$\therefore n \times (4/3) \times \pi \times r_s^3 = (1/3) \times \pi \times r_c^2 \times h$

$n \times 4 \times 3^3 = 12^2 \times 24$

$n \times 9 = 12 \times 24$

$n = 32$

$\therefore$ Number of balls formed = 32

Question: 6

A hemisphere bowl

Solution:

Given: diameter of hemisphere = 30 cm

$\therefore$ Radius of hemisphere = $r_h = 30/2 = 15$cm

Diameter of cylindrical shaped bottles = 5 cm

$\therefore$ radius of cylindrical shaped bottles = $5/2 = r_c = 2.5$ cm

Height of cylindrical shaped bottle = h = 6 cm

Formula: volume of hemisphere = (volume of sphere/2) = $(2/3)\pi r_h^3$

Volume of cylinder = $\pi r_c^2 h$

Let ‘n’ bottles are required

As we are filling the cylindrical bottles with liquid in hemispherical bowl hence we can say that

volume of liquid in cylindrical bottles = volume of liquid in hemisphere

$\therefore n \times \pi \times r_c^2 \times h = (2/3) \times \pi \times r_h^3$

$n \times 2.5^2 \times 6 \times 3 = 2 \times 15^3$

$n \times 6.25 \times 9 = 3375$

$n = 3375/56.25$

$n = 60$

Therefore 60 cylindrical shaped bottles are required to fill the liquid from hemispherical bowl.

Question: 7

A solid metallic

Solution:

Given: diameter of sphere = 21 cm

$\therefore$ radius of sphere = r_s = (21/2) cm

Diameter of cone = 3.5 cm

$\therefore$ radius of cone = r_c = 3.5/2 = 1.75 = (7/4) cm

Height of cone = h = 3 cm

Formula: volume of sphere = $(4/3)\pi r_s^3$

Volume of cone = $(1/3)\pi r_c^2 h$

Sphere is melted and then cones are made from molten metal therefore the volume remains same

Let 'n' be the number of cones made

i.e. volume of n cones = volume of sphere

$\therefore n \times (1/3) \times \pi \times r_c^2 \times h = (4/3) \times \pi \times r_s^3$

$$\therefore n \times \frac{7^2}{4^2} \times 3 = 4 \times \frac{21^3}{2^3}$$

$$\Rightarrow n = \frac{16 \times 21 \times 9}{2 \times 3} = 8 \times 21 \times 3 = 504$$

Therefore number of cones formed = 504

Question: 8

The diameter of a

Solution:

Given: diameter of sphere = 42 cm

$\therefore$ radius of sphere = 42/2 = r_s = 21 cm

Diameter of cylindrical wire = 2.8 cm

$\therefore$ Radius of cylindrical wire = r_c = 1.4 = (7/5)cm

Let l be the length of wire

Formula: volume of sphere = $(4/3)\pi r_s^3$

Volume of wire = $\pi r_c^2 l$

Sphere is melted and wire is made from it

$\therefore$ volume of sphere = volume of wire

$(4/3)\pi r_s^3 = \pi r_c^2 l$

$4 \times 21^3 = 3 \times (7/5)^2 \times l$

$4 \times 21 \times 9 \times 25 = 3 \times l$

$2100 \times 3 = l$

l = 6300 cm

Therefore length of wire formed = 6300 cm = 63 meters

Question: 9

A drinking glass

Solution:

Given: Height of glass = h = 21 cm

Diameter of lower circular end of glass = 4 cm

Diameter of upper circular end of glass = 6 cm

∴ Radius of lower circular end = r = 4/2 = 2 cm

∴ Radius of upper circular end = R = 6/2 = 3 cm

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h(R^2 + r^2 + Rr)$ cm^3

Capacity of glass = volume of frustum

$\therefore$ capacity of glass $= \frac{1}{3} \times \frac{22}{7} \times 21 \times (3^2 + 2^2 + 3 \times 2)$

= 22 × (9 + 4 + 6)

= 22 × 19

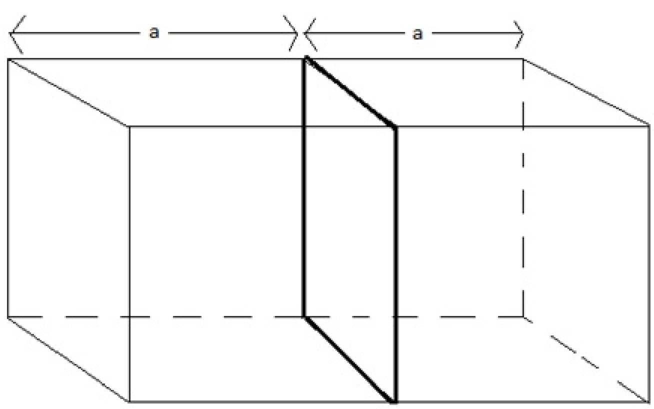
= 418 cm^3

∴ Capacity of glass = 418 cm^3

Question: 10

Two cubes, each o

Solution:



volume of each cube = 64 cm^3

Let a be the side length of each cube

∴ $a^3 = 64$

a = 4 cm

The figure shows both the cubes joined together after joining we get a cuboid of length 2a and breadth a and height a

Length of cuboid formed = l = 2a

l = 8 cm

Breadth of cuboid formed = b = 4 cm

Height of cuboid formed = h = 4 cm

In the cuboid so formed there are 4 rectangular surfaces of length l = 8 and breadth b = 4 and 2 square surfaces of length 4

Total surface area of cuboid = $4 \times l \times b + 2a^2$

$= (4 \times 8 \times 4) + (2 \times 4^2)$

$= 128 + 32$

$= 160\ cm^2$

Total surface area of cuboid = $160\ cm^2$

Question: 11

The radius of the

Solution:

Given: volume of cylinder = $1617\ cm^3$

Let r be the radius of base and h be the height of cone

r:h = 2:3

$\therefore r/h = 2/3$

$3r = 2h$

$h = 3r/2$ ...(i)

Formula: volume of cylinder = $\pi r^2 h$

$\therefore 1617 = (22/7)\ r^2 h$

$r^2 h = 514.5$

Using (i) we have

$\therefore r^2 \times (3r/2) = 514.5$

$3r^3 = 1029$

$r^3 = 343$

r = 7 cm

h = 21/2 cm

Total surface area of cylinder = $2\pi r^2 + 2\pi rh$

$= 2 \times (22/7) \times 7^2 + 2 \times (22/7) \times 7 \times (21/2)$

$= 308 + 462$

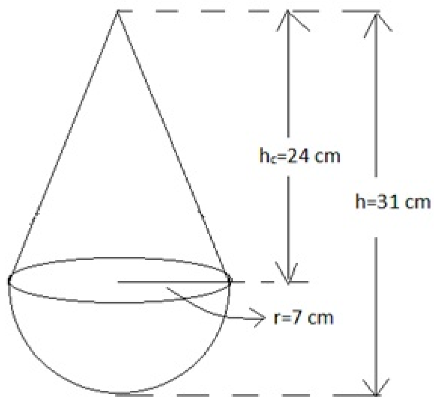
$= 770\ cm^2$

Therefore total surface area of cylinder = $770\ cm^2$

Question: 12

A toy is in the f

Solution:



Given: Height of toy = h = 31 cm

Radius of hemisphere = radius of base of cone = r = 7 cm

From the figure we can calculate height of cone as

Height of cone = h_c = h - r

= 31 - 7 = 24 cm

∴ h_c = 24 cm

Formula: surface area of hemisphere = surface area of sphere/2 = $2\pi r^2$

Curved surface area of cone = πrl

Where l is slant height

$$l = \sqrt{r^2 + h_c^{\,2}}$$

l = √(49 + 576) = 25 cm

∴ l = 25 cm

Total surface area of toy = curved surface area of cone + surface area of hemisphere

Surface area of hemisphere = $2 \times \pi \times r^2$

= $2 \times (22/7) \times 7^2$

= 308 cm^2

Curved surface area of cone = π × r × l

= (22/7) × 7 × 25

= 550 cm^2

∴ Total surface area of toy = 308 + 550

= 858 cm^2

∴ Total surface area of toy = 858 cm^2

Question: 13

A hemispherical b

Solution:

Given: Radius of hemisphere = r_h = 9 cm

Diameter of cylindrical shaped bottles = 3 cm

∴ radius of cylindrical shaped bottles = r_c = 3/2 = 1.5 cm

Height of cylindrical shaped bottle = h = 4 cm

Formula: volume of hemisphere = (volume of sphere/2) = $(2/3)\pi r_h^3$

Volume of cylinder = $\pi r_c^2 h$

Let 'n' bottles are required

As we are filling the cylindrical bottles with liquid in hemispherical bowl hence we can say that

volume of liquid in cylindrical bottles = volume of liquid in hemisphere

$\therefore n \times \pi \times r_c^2 \times h = (2/3) \times \pi \times r_h^3$

$n \times (3/2)^2 \times 4 \times 3 = 2 \times 9^3$

$n = 3^3 \times 2$

$n = 27 \times 2$

$n = 54$

Therefore 54 cylindrical shaped bottles are required to fill the liquid from hemispherical bowl.

Question: 14

The surface areas

Solution:

Let r be the radius of sphere and a be the side length of cube.

Let S_s be the surface area of sphere and S_c be the surface area of cube and V_s be volume of sphere and V_c be volume of cube

$\therefore S_s = 4\pi r^2$ and $S_c = 4a^2$

Given that surface area of sphere and cube are equal

$\therefore S_s = S_c$

$4\pi r^2 = 6a^2$

$r^2/ a^2 = 3/2\pi$

$$\therefore \frac{r}{a} = \frac{\sqrt{3}}{\sqrt{2\pi}} \ldots \text{(i)}$$

$V_s = (4/3)\ \pi r^3$

$V_c = a^3$

$\therefore V_s/V_c = 4\pi r^3/3a^3$

Using (i)

$$\therefore \frac{V_s}{V_c} = \frac{4 \times \pi \times 3\sqrt{3}}{3 \times 2\pi \times \sqrt{2\pi}} = \frac{2\sqrt{3 \times 7}}{\sqrt{44}} = \frac{\sqrt{21}}{\sqrt{11}}$$

$\therefore V_s/V_c = \sqrt{21}/\sqrt{11}$

Therefore ratio of their volumes is $V_s{:}V_c = \sqrt{21}{:}\sqrt{11}$

Question: 15

The slant height

Solution:

Given: perimeter of upper circle = 18 cm

Perimeter of lower circle = 6 cm

Slant height of frustum = l = 4 cm

Formula: Total surface area of frustum = $\pi r^2 + \pi R^2 + \pi(R + r)l$ cm^2

Let r be the radius of lower circle and R be the radius of upper circle

Now perimeter of circle = circumference of circle = $2\pi \times$ radius

$\therefore$ Perimeter of upper circle = $2\pi R$

$18 = 2 \times \pi \times R$

$R = 9/\pi$ cm

Perimeter of lower circle = $2\pi r$

$6 = 2 \times \pi \times r$

$r = 3/\pi$ cm

Now we have asked curved surface area, so we should subtract the top and bottom surface areas which are flat circles.

Surface area of top = πR^2

Surface area of bottom = πr^2

$\therefore$ Curved surface area = total surface area - πr^2 - πR^2 cm^2

$= \pi r^2 + \pi R^2 + \pi(R + r)l - \pi r^2 - \pi R^2$ cm^2

$= \pi(R + r)l$ cm^2

$= \pi \times [(9/\pi) + (3/\pi)] \times 4$ cm^2

$= (9 + 3) \times 4$ cm^2

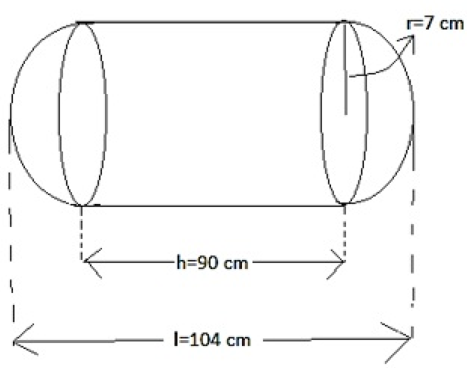
$= 48$ cm^2

$\therefore$ curved surface area = 48 cm^2

Question: 16

A solid is compos

Solution:



Total length of solid = l = 104 cm as shown in figure

The solid consist of a cylinder and two hemispheres

Let the height of cylinder be h

We get the height h by subtracting the radii of left and right hemisphere from the total length l as seen in figure

$\therefore$ h = 104 - (7 + 7) cm

$\therefore$ h = 90 cm

Let r be the radius of hemisphere and the radius of cylinder

∴ r = 7 cm

There are two hemisphere one at left and one at right both of same radius r and two hemispheres make one sphere

Surface area of sphere = $4\pi r^2$

The flat circles i.e. the upper and lower circles of cylinder are not to be considered in the surface area of whole solid as they are covered by the hemispheres therefore for cylinder we will take its curved surface area

Curved surface area of cylinder = $2\pi rh$

Surface area of solid = surface area of sphere + curved surface area of cylinder

$= 4\pi r^2 + 2\pi rh$

$= 2 \times (22/7) \times 7 \times (2 \times 7 + 90)$

$= 44 \times 104$

$= 4576 \text{ cm}^2$

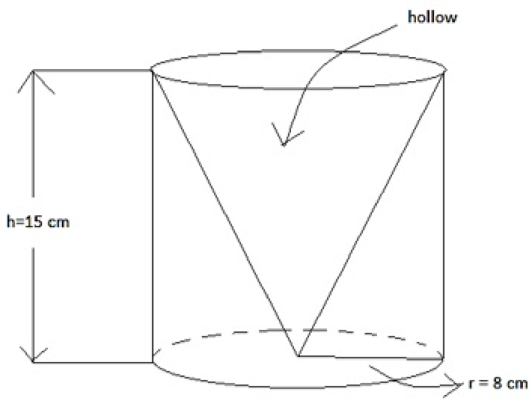
Therefore total surface area of solid = 4576 cm^2

Question: 17

From a solid cyli

Solution:

after removing the conical solid the cylinder would look like this



Given: height of cylinder = height of cone = h = 15 cm

Diameter of cylinder = diameter of base cone = 16 cm

∴ radius of cylinder = radius of base of cone = 16/2 = r = 8 cm

Formula: total surface area of cylinder = $2\pi r^2 + \pi rh$

Total surface area of cone = $\pi rl + \pi r^2$

Where l is the slant height

$l = \sqrt{(r^2 + h^2)}$

$l = \sqrt{(8^2 + 15^2)}$

$l = \sqrt{289}$

l = 17 cm

In the solid as seen in figure we have the curved surface of cylinder and the base of cylinder as there is no top circular face of the cylinder we should subtract its area from total surface area of cylinder

Area of top circular surface of cylinder = πr^2

$\therefore$ surface area of cylinder in solid = $2\pi r^2 + \pi rh - \pi r^2$

= $\pi r^2 + \pi rh$

= 3.14 × 8 × (8 + 15)

= 3.14 × 8 × 23

= 577.76 cm^2

Now there is a hollow conical part with no base of the cone as seen in the figure therefore we should subtract the surface area of base of cone from the total surface area of cone

Surface area of base of cone = πr^2

$\therefore$ Surface area of conical part in solid = $\pi rl + \pi r^2 - \pi r^2$

= πrl

= 3.14 × 8 × 17

= 427.04 cm^2

Therefore total surface area of solid = surface area of cylinder in solid + surface area of

conical part in solid

= 577.76 + 427.04

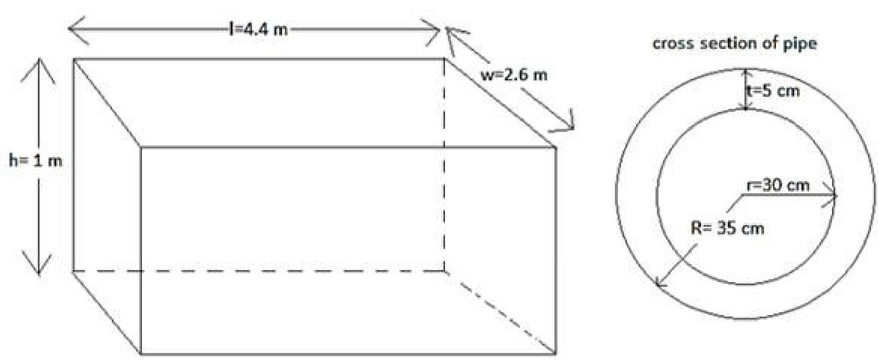
= 1004.8 cm^2

Surface area of solid = 1004.8 cm^2

Question: 18

A solid rectangul

Solution:



Given: length of the block = l = 4.4 m

Width of the block = w = 2.6 m

Height of the block = h = 1 m

Inner radius of pipe = r = 30 cm = 0.3 m

Thickness of pipe = t = 5 cm = 0.05 m

$\therefore$ outer radius of pipe as seen in the cross section of pipe = R = r + t = 30 + 5 = 35 cm = 0.35 m

Let l be the length of the pipe

Formula: volume of block = l × w × h

= 4.4 × 2.6 × 1

= 11.44 m^3

Volume of block = 11.44 m^3

Volume of pipe = π × (radius)^2 × (length)

Volume of pipe material = volume of full pipe(R = 0.35) – volume of hollow cylinder(r = 0.3)

= π × 0.35^2 × l - π × 0.3^2 × l

= π × l × [(35/100)^2 - (3/10)^2]

= π × l × [(35/100) + (3/10)] × [(35/100) - (3/10)]

$$= \pi \times l \times \frac{65}{100} \times \frac{5}{100}$$

= (22/7) × l × (13/400) m^3

∴ volume of pipe material = (22/7) × l × (13/400) m^3

The pipe is made from the block

∴ volume of block = volume of pipe material

∴ 11.44 = (22/7) × l × (13/400)

$$\therefore l = \frac{7 \times 400 \times 11.44}{22 \times 13} = \frac{28 \times 52}{13}$$

∴ l = 28 × 4

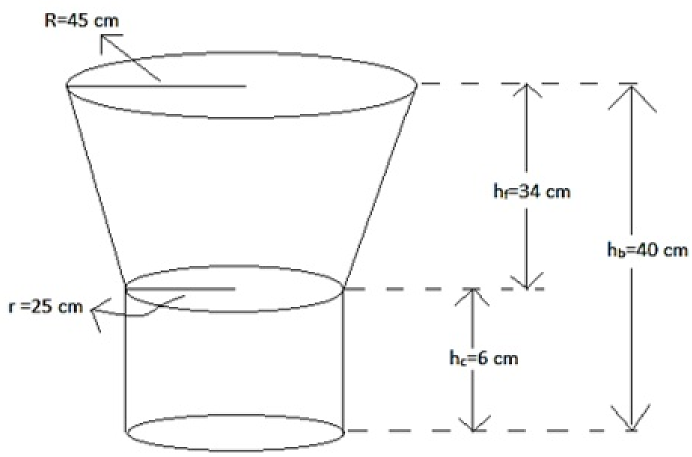
∴ l = 112 m

Length of the pipe = 112 m

Question: 19

An open metal buc

Solution:



Given: radius of upper circular end of frustum = R = 45 cm

Radius of lower circular end of frustum = radius of cylindrical base = r = 25 cm

Height of bucket = h_b = 40 cm

Height of cylindrical base = h_c = 6 cm

From the figure height of frustum = h_f = h_b - h_c

= 40 - 6

∴ h_f = 34 cm

Formula: Volume of frustum of cone $= \frac{1}{3}\pi h_f(R^2 + r^2 + Rr)$ cm^3

Volume of cylinder = $\pi r^2 h_c$

Curved surface area of cylinder = $2\pi rh_c$

curved surface area of frustum = $\pi(R + r)l$ cm^2

Where l = slant height

For slant height we have $l = \sqrt{(R-r)^2 + h_f^2}$ cm

$\therefore l = \sqrt{(45-25)^2 + 34^2}$

= √(400 + 1156)

= 39.44 cm

Area of metallic sheet used = curved surface area of frustum + curved surface area of base cylinder + area of base circle of cylinder

now, curved surface area of frustum = π × (R + r) × l cm^2

= (22/7) × (45 + 25) × 39.44 cm^2

= 22 × 10 × 39.44 cm^2

= 8676.8 cm^2

Curved surface area of base cylinder = $2\pi rh_c$

= 2 × (22/7) × 25 × 6

= 942.85 cm^2

Surface area of base circle of cylinder = πr^2

= (22/7) × 25^2

= 1964.28 cm^2

∴ Area of metallic sheet used = 8676.8 + 942.85 + 1964.28

= 11583.93 cm^2

Therefore, area of metallic sheet used to make the bucket is 11583.93 cm^2 i.e. 1.158393 m^2

Volume of water bucket can hold = volume of bas cylinder + volume of frustum

Volume of base cylinder = $\pi r^2 h_c$

= (22/7) × 25^2 × 6

= 11785.71 cm^3

volume of frustum $= \frac{1}{3} \times \frac{22}{7} \times 34 \times (45^2 + 25^2 + 45 \times 25)$

$= \frac{748}{21} \times (2025 + 1750)$

= 35.62 × 3775

= 134465.5 cm^3

∴ volume of water bucket can hold = 11785.71 + 134465.5

= 146251.21 cm^3

Now 1 litre is 1000 cm^3

∴ 146251.21 cm^3 = 146251.21/1000 = 146.25121 litres

Volume of water bucket can hold = 146.25121 litres

Question: 20

A farmer connect

Solution:

Given: diameter of pipe = 20 cm

∴ radius of pipe = r_p = 20/2 = 10 cm = 0.1 m

Diameter of tank = 10 m

∴ radius of cylindrical tank = r_c = 10/2 = 5 m

Depth of cylindrical tank = height of cylindrical tank = h = 2 m

Rate of flow of water through pipe = 4 km/hr

1 km = 1000 m

4 km/hr = 4000 m/hr

Volume of water required to completely fill the tank is equal to the volume of cylinder

Time require to fill the tank = volume of cylindrical tank/volume of water flown through pipe per hr

volume of cylindrical tank = $\pi \times r_c^2 \times h$

$= 3.14 \times 25 \times 2$

$= 157\ m^3$

volume of water flown through pipe per hr = $\pi \times r_p^2 \times 4000$

$= 3.14 \times 0.1^2 \times 4000$

$= 3.14 \times 40$

$= 125.6\ m^3/hr$

Time require to fill the tank = 157/125.6

= 1.25 hrs

Therefore, it will take 1.25 hours to fill the tank completely.